Volume 10, No. 5 September, 1955

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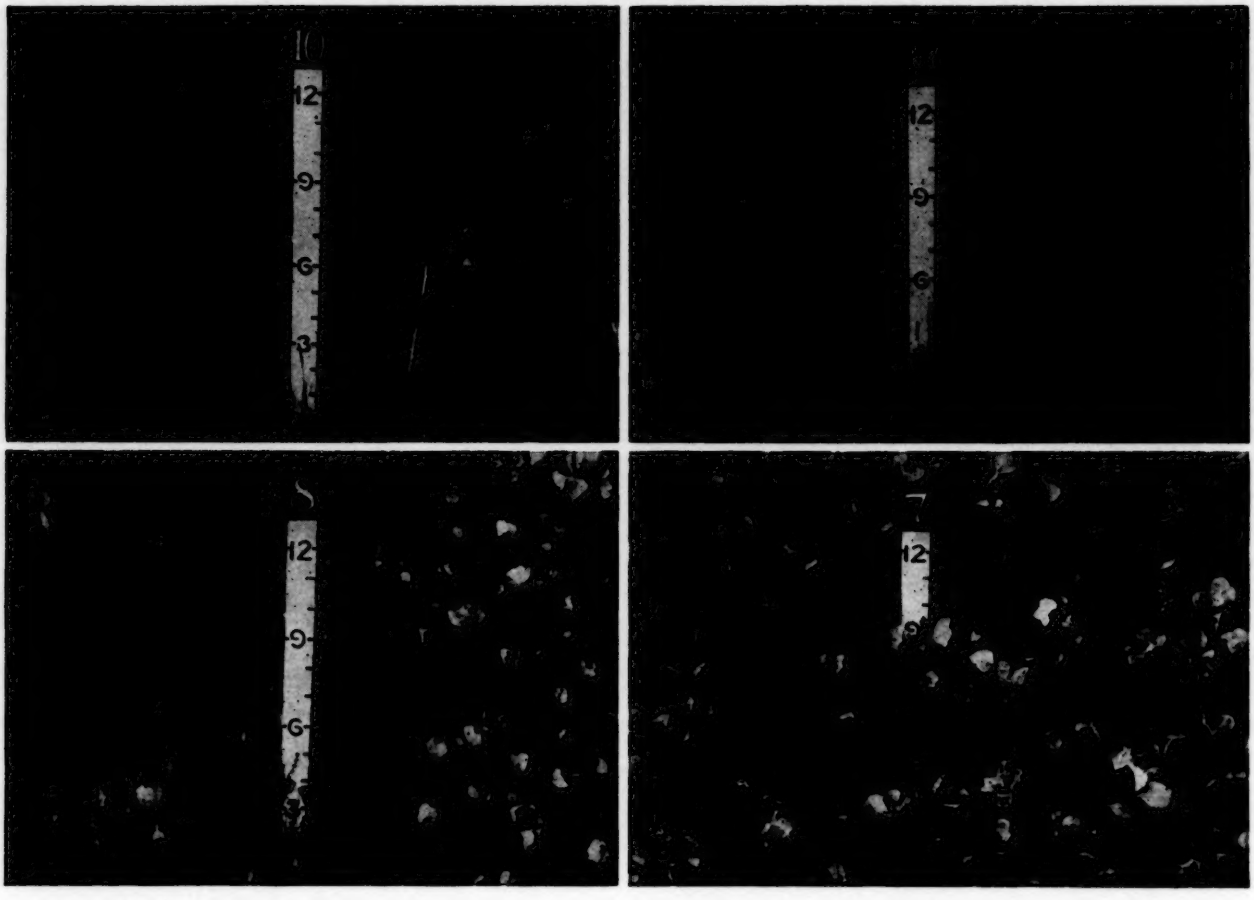
Competition, Key to Soil Conservation Teaching

. . . LOYD M. ADCOCK

Book Reviews: Our National Forests; America's Needs and Resources; Muskingum Country; Climate Atlas of the United States; The Story of FAO; Streams, Lakes and Ponds; also others.



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**Austr. J. Agric. Res.* 3, 95-110 (1952).

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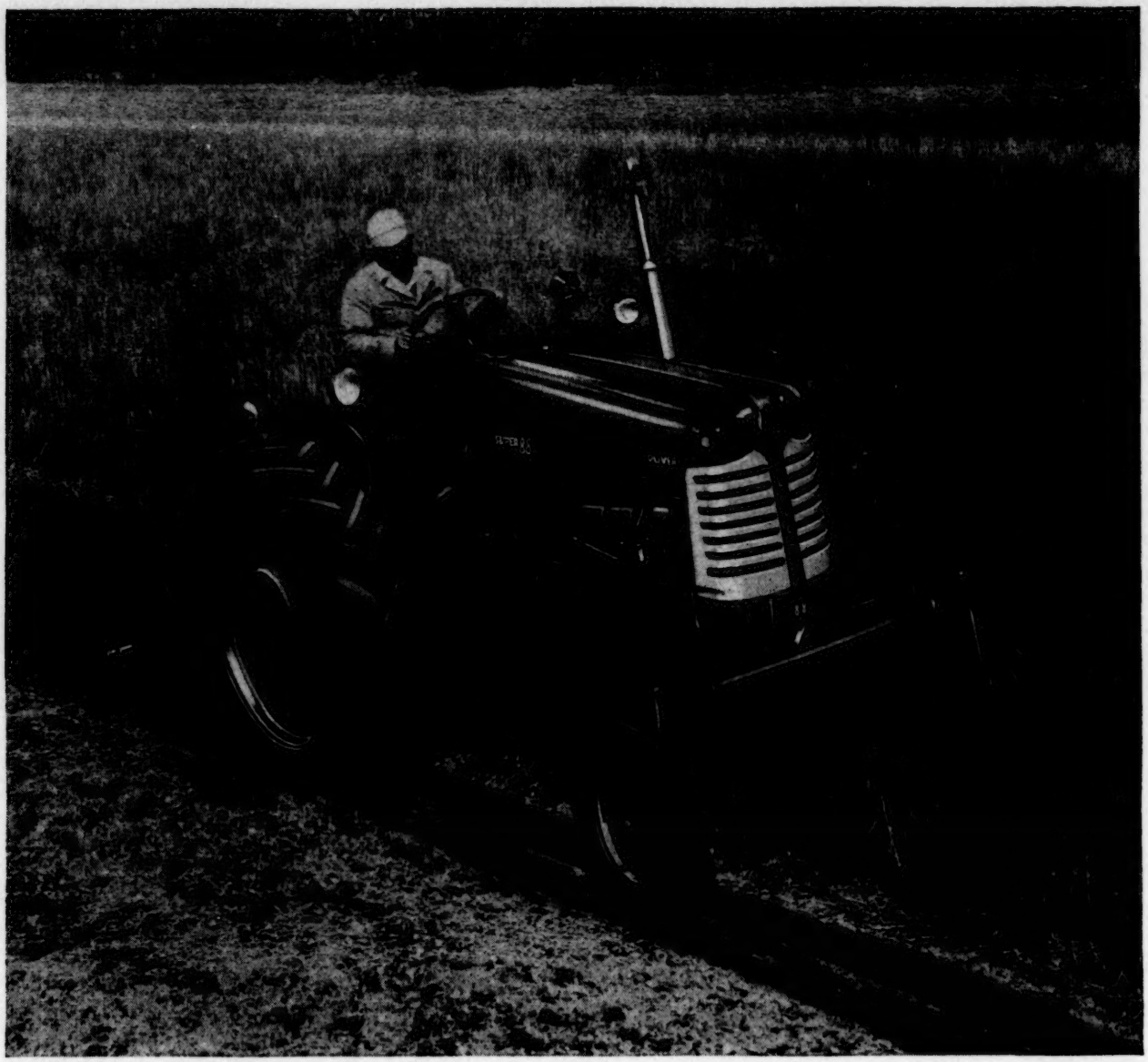

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***Cover Photo:** Forests, as a renewable resource, are vital to the economic, physical and spiritual security of the nation. Upon their effective protection and management, as shown in this fine stand of virgin white oak, hinges the future of much of our soil and water resources.*

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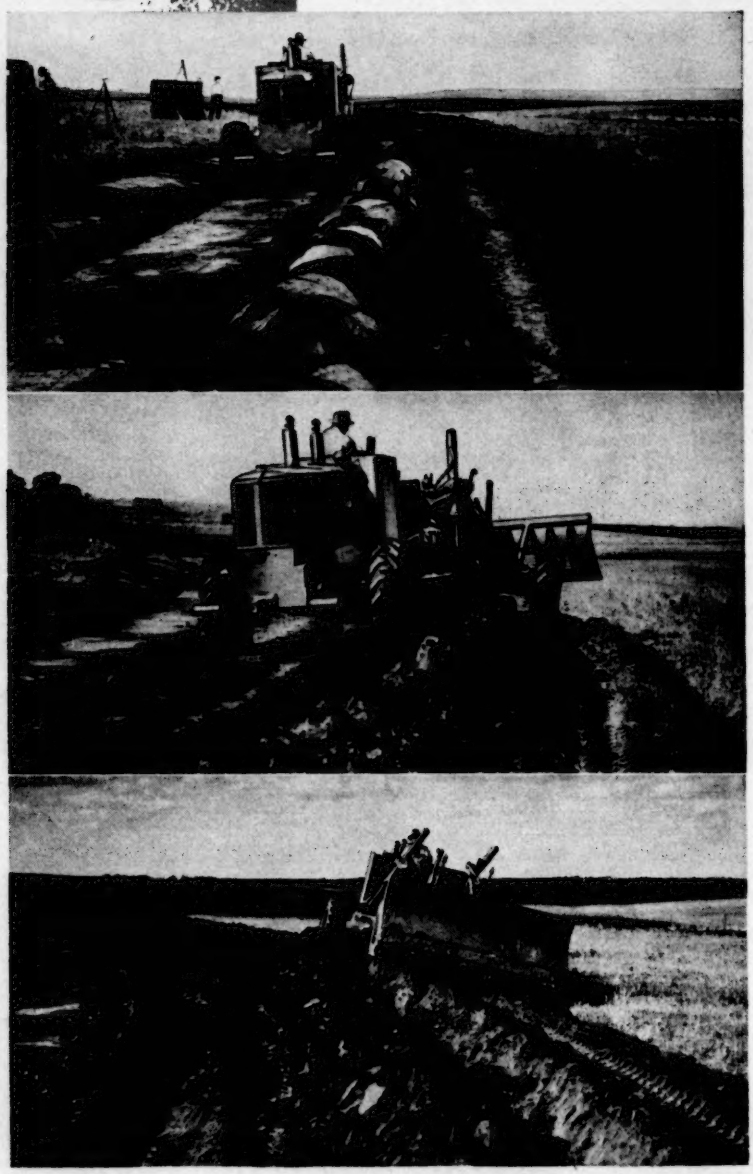

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Downstream Effects of Upstream Floodwater-Retarding Structures

M. A. HARTMAN AND RICHARD W. WILKE

This article summarizes a study made by the Department of Agriculture to forecast the probable effects of a system of upstream floodwater-retarding structures on downstream flood flows. Hydrographs of four representative floods with and without the structures are compared to show the computed effect on flood flows of these structures on the Verdigris River watershed above Coyville, Kansas.

Effectiveness of the structures increases with storm magnitude from a minimum of no effect on a flood small enough to pass unimpeded through the structure outlets, to a maximum of about 55 per cent on the largest flood which could be controlled without emergency spillway discharge. The effectiveness is decreased on floods which exceed the storage capacity of the reservoir pool.

In an area such as this, upstream floodwater-retarding structures can be expected to effect an appreciable reduction in downstream flood peaks. In the case of storms centered over the structured area, this reduction in peak remains significant for an appreciable distance downstream.

A study of the Upper Verdigris River watershed was made in 1954-55 as a part of the Arkansas-White-Red-Basins Inter-Agency investigation. Its purpose was to obtain information needed to coordinate upstream watershed-treatment programs with downstream projects.

ONE OF THE SPECIFIC objectives of this study was to predict the probable effects of a system of upstream floodwater-retarding structures on the flood hydrographs of four representative-sized floods at the Coyville, Kansas, stream gage, about 3.4 miles downstream from the site where Toronto reservoir is now under construction by the Corps of Engineers. The drainage area above Coyville is 747 square miles. The date and peak discharge of the four floods selected for analysis from the 13 years of streamflow record (1940 through 1952) at the Coyville gage are shown in Table 1.

The system of upstream floodwater-retarding structures considered here consists of 141 structures in the Verdigris watershed above Toronto dam site. Of these, 85 have a contributing drainage area of

Figure 1. Location of Floodwater Retarding Structures in the Upper Verdigris River Watershed, Kansas.

M. A. Hartman is hydraulic engineer for the Soil Conservation Service with headquarters in Fort Worth, Texas. Richard W. Wilke is hydrologist, United States Forest Service, Missoula, Montana.

The writers wish to express their appreciation to L. L. Kelly, soil conservationist, under whose direction this study was made; also to Victor Mockus and R. G. Andrews for technical advice and assistance and to the many others who participated in the various phases of the study.

less than two square miles, 36 have two to five square miles, 16 have five to 10 square miles, and four have 10 to 20 square miles. The average area above each site is about 2.8 square miles.

Locations for these structures were selected by a map and field reconnaissance with a view to utilizing all sites which were suitable topographically and would not result in inundation of cropland, roads, bridges, utility lines, farmsteads or other property of high value. A total of about 400 square miles of the watershed lies above these structure sites, or about 53 per cent of the total watershed area. The site locations are shown in figure 1.

A five-foot interval contour map of each structure site and 10-foot interval map of each reservoir pool area were made with a Kelsh plotter from aerial photos and field control points. Storage capacity, surface pool area, and fill volume curves were developed from these maps for each site.

Structures were assumed to be of earth fill construction with 2:1 and 3:1 side slopes, a minimum top width of 12 feet, and automatic drawdown tube of reinforced concrete designed to discharge 15 cubic feet per second per square mile of drainage area, a sodded emergency spillway to carry a one per cent chance flood on a full pool, and storage capacity ranging from 3.7 inches for areas smaller than 1,500 acres to 5.7 inches for areas over 2,500 acres.

The structures would contain a total of 10,280,000 cubic yards of fill. They would have an aggregate combined detention and storage capacity of about 112,000 acre-feet at emergency spillway level.

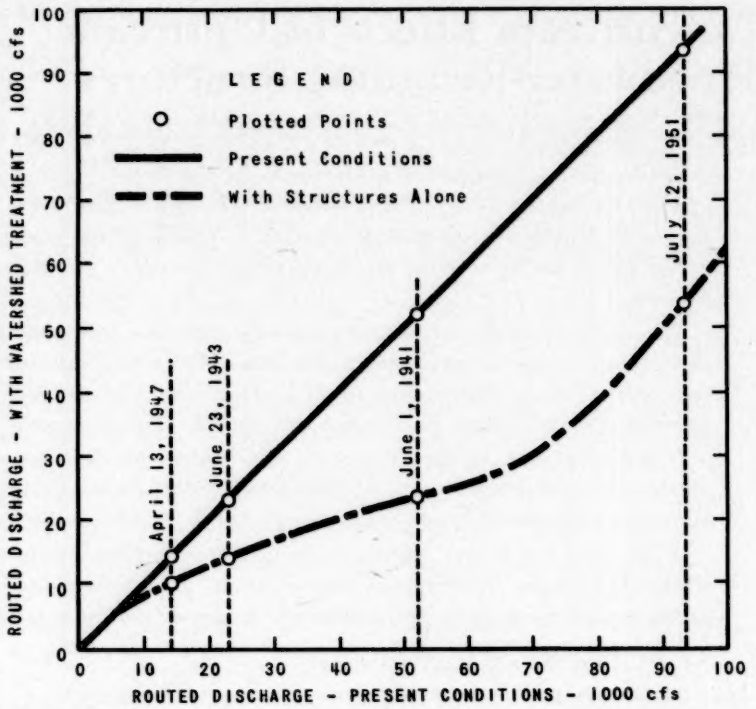

Figure 2. Effect of Program on Peak Discharge at Coyville, Kansas. Upper Verdigris River Watershed.

Procedure

The watershed was subdivided, following watershed and stream boundaries, into 28 subareas as shown in Figure 1.

All available rainfall data for the area were studied. The rain producing each storm, and that antecedent to each of the four selected floods, was analyzed in detail. Isohyetal maps, generally for 24-hour periods, were prepared for each of the four floods. After study of these maps, final estimation of the rainfall for each of the four events for each of the subareas was made in terms of hourly amounts.

Total runoff from each of the subareas for each of the four storms was estimated by a method using rainfall-runoff relationships in which account was taken of the extent of soil groups; land use, cover condition, and type of farming practices; antecedent moisture conditions; duration of storm and total rainfall, and season in which the flood occurred. Total runoff for the watershed, as estimated by these procedures, was compared with total direct runoff at the Coyville gage and indicated adjustments made in the various factors where necessary.

Triangular runoff hydrographs were prepared for each of the four floods for each of the subareas, taking into account the variations in the above factors.

The same general procedures were used to estimate total runoff and construct triangular hydrographs for each subarea for each of the four floods with the system of 141 floodwater-retarding structures assumed to be in effect.

The main stem and major tributaries were subdivided into 21 reaches to be used in routing the four floods. Stream bed profiles, stream and valley cross sections, and high water marks for the 1951 flood were obtained for all reaches. Manning's "n" values were determined for channel and overbank flows at representative points for each reach based on the 1951 high water mark elevations and computed discharges at each reach.

Triangular hydrographs were prepared for each of the four floods from each subarea as it was routed downstream to the Coyville gage by a modified Goodrich-Wisler[1] flood-routing procedure.

[1]Discussion by R. D. Goodrich of "Flood Routing," by Edward J. Rutter, Quintin B. Graves and Franklin F. Snyder, Trans. Amer. Soc. Civil Engrs. Vol. 104, pp. 295-298, 1939.

Figure 3. Three small upstream floodwater retarding structures following nine-inch rainfall. Note the land treatment measures above structures.

As a matter of general interest the four floods, assuming structures in effect above Coyville, were further routed downstream to Altoona at a drainage area of 1,138 square miles and to Independence at a drainage area of 2,892 square miles. The Wilson method[2] of routing was used and the difference between the observed flood flow routed downstream and the observed downstream flood flow was taken as local inflow between the gaging stations.

The four storms were selected as representative of storms producing floods at Coyville and are not representative of storms producing floods at Altoona or Independence. The effectiveness of structures varies considerably, depending on the distribution and variation of volume and intensity of storm runoff with respect to the location of the floodwater-retarding structures. The drainage area controlled by these structures is 400 square miles. This is 53 per cent of the area above Coyville, 35 per cent of the area above Altoona and 14 per cent of the area above Independence.

[2] "A Graphical Method of Flood Routing," by Walter T. Wilson, Amer. Geophys. Trans. Part III, pp. 893-897. August 1941.

Results

A summary of the peak discharges and the per cent reductions in peak which the study showed would be effected by the structures are shown in Table 1.

Table 1. Peak Discharges and Reductions

	Date of Floods			
	April 1947	June 1943	June 1941	July 1951
Coyville—747 square miles				
Observed peak discharge	16,600	[1]36,900	51,800	[2]130,000
Routed present conditions	14,595	23,115	52,280	93,500
Routed with structures	10,295	14,020	23,280	53,770
Per cent reduction	29.5	39.3	55.5	42.5
Altoona—1,138 square miles				
Observed peak discharge	18,220	26,890	34,600	71,000
Routed with structures	18,000	21,000	23,000	48,000
Per cent reduction	1.2	21.9	33.5	32.4
Independence—2,892 square miles				
Observed peak discharge	46,250	35,500	25,625	72,800
Routed with structures	46,250	31,000	24,000	56,500
Per cent reduction	0	12.7	6.3	22.4

[1] Original U.S.G.S. estimate of 24,100 cfs was later revised to 36,900 cfs.
[2] Based on slope-area computation.

A detailed study was made of crop and pasture damage on the main stem and principal tributary floodplains. Estimates were also made of other agricultural damage, such as to farm buildings, livestock, stored crops, etc. The studies of these damages were in less detail than those for crop and pasture damage.

Based on the flood routings of the four floods under the three conditions of treatment, i.e., with land treatment, with reservoirs, and with both land treatment and reservoirs, the reduced discharge was computed for each flood in the series. The corresponding reduced average damage per year was also computed for the 13-year period. The studies showed that the application of the recommended land treatment program would reduce average annual damages on stream reaches under consideration by 25 per cent. The installation of the structures alone would reduce average annual damages by 56 per cent and a combination of structures and land treatment by 65 per cent.

Since the investigations were necessarily confined to a detailed analysis of only four storms, these storms were selected to be representative of the range of magnitude of the observed floods of record. To indicate the effect which the structures would have on any flood, the routed peak discharges at Coyville with structures were plotted against the routed peak discharges without structures for each of the four floods and a curve drawn through the plotted points as shown in Figure 2.

Since the exact breaking point in the curve has not been determined, the upper portion has been sketched in merely to give an indication of the probable trend. For use in estimating the effect of the structures on any flood, the curve has several obvious limitations. It is, of course, representative only of the effectiveness of the particular system of structures and for the particular storage and discharge criteria used in the analysis.

.The curve would be altered somewhat, particularly in the upper and lower extremities, by significant variations in the distribution of the quantity and intensity of rainfall and runoff producing the flood. Moreover, the curve is based on the effect of structures on floods occurring when the reservoir pools are empty.

These limitations, however, are not serious since they concern extreme conditions which are readily recognizable. The range of the curve in which most floods occur is affected least by these variations and probably represents a reasonably accurate measure of the effect of the structures on most floods of record.

Farm Pond Production

The average daily growth of fish per surface unit is a significant measure of production for intensive fish farming. This is measured in pounds per acre per day in the United States and is similar to measuring livestock production. This yardstick has not been used commonly in American fisheries research because it has been thought that such intensive production was not in demand. By measuring the daily production in weight, we can follow the rate of growth attained by fish of different sizes and in various population concentrations. A periodic check of the growth rate and daily yield is a fish farmer's check against overcrowding.

In Israel, Jamaica, Haiti, Indonesia, Europe and elsewhere, studies have shown that the greatest growth per acre occurs while the weight of the fish is approximately 50 to 70 per cent of the water's carrying capacity. When their weight exceeds 70 per cent of the carrying capacity, the growth rate and production are reduced. The crop then should be harvested or thinned to reduce the number of fish. Our encouragement of "heavy fishing" *in the self-perpetuating pond accomplished a thinning of the population.*

—Verne E. Davison, *1955, North American Wildlife Conference, Montreal, Canada.*

Conservation Under the Federal Payments Programs of Cost Sharing

ROBERT L. TONTZ

THE PASSAGE OF THE Soil Conservation and Domestic Allotment Act of 1936 represented a significant development affecting conservation policy for American agriculture. This momentous act had as one of its goals the protection of the future supply of the nation's farm land. To implement this policy, annual conservation programs of cost-sharing between the federal government and the farmer were undertaken. As stated by Secretary of Agriculture, Ezra Taft Benson, the fundamental purpose of the agricultural conservation payments programs of cost-sharing was to provide a means by which the public could share with land-owners and operators the cost of carrying out needed conservation work over and above that which they would do with only their own resources (1).

Purpose

Only limited information is available in conservation literature showing funds used and practices carried out under the federal conservation programs of cost-sharing. Some basic questions needing answers include:

1. What was the extent of the cost-sharing programs in terms of federal funds expended?
2. How were the federal funds utilized according to conservation practices?
3. What acreage changes characterized the major conservation practices?

Answers to these questions should provide a convenient reference in which limited but significant characteristics of the federal conservation cost-sharing programs are summarized. As such they should also provide useful background material for analytical studies designed to improve the performance of the conservation programs.

Extent of Programs

The term, conservation, is a concept of many meanings (2). The federal payments programs operate under a broad definition of conservation which encompasses not only maintenance, but improvement of resources as well (3). The federal conservation programs of cost-sharing include many different practices. In 1947 the national program included 141 different conservation practices (4). The range in number of practices during 1947-1952 was from 120 in 1948 to 166 in 1952 (5). Although there were many different practices, the bulk of the conservation payments were made for considerably fewer practices than the total available. In 1952, for example, over three-fourths of the federal payments were used for only nine per cent of the total number of practices (6).

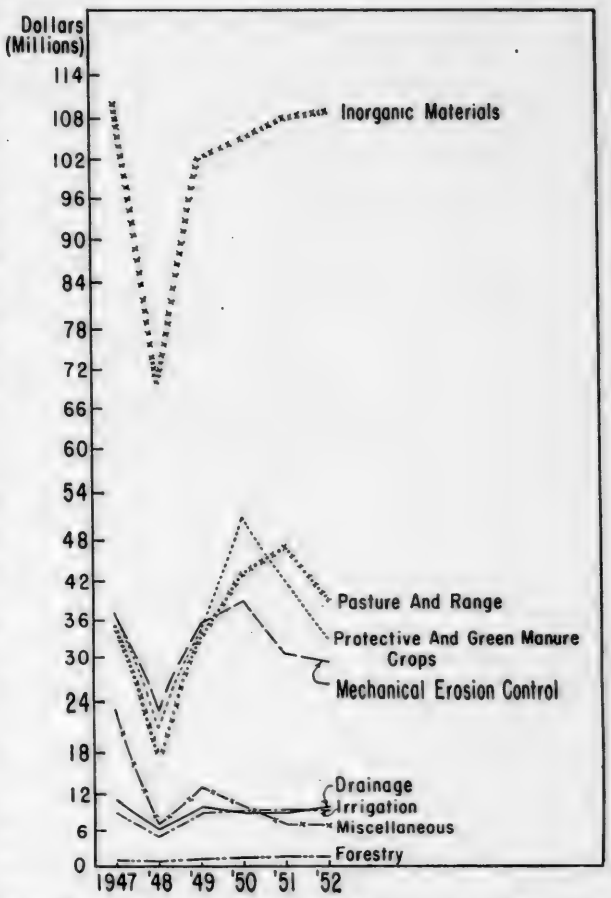

Figure 1. Distribution of Federal Payments for Conservation Practices, United States and Insular Areas, 1947-1952.

No specific designation was offered as to what constituted annual and recurring practices as compared with permanent practices, it was indicated that there was no repetition on the same land for the permanent practices, whereas for the annual and recurring type of practices it was possible that the practice may have been carried out on the same land more than once during the period covered (7).

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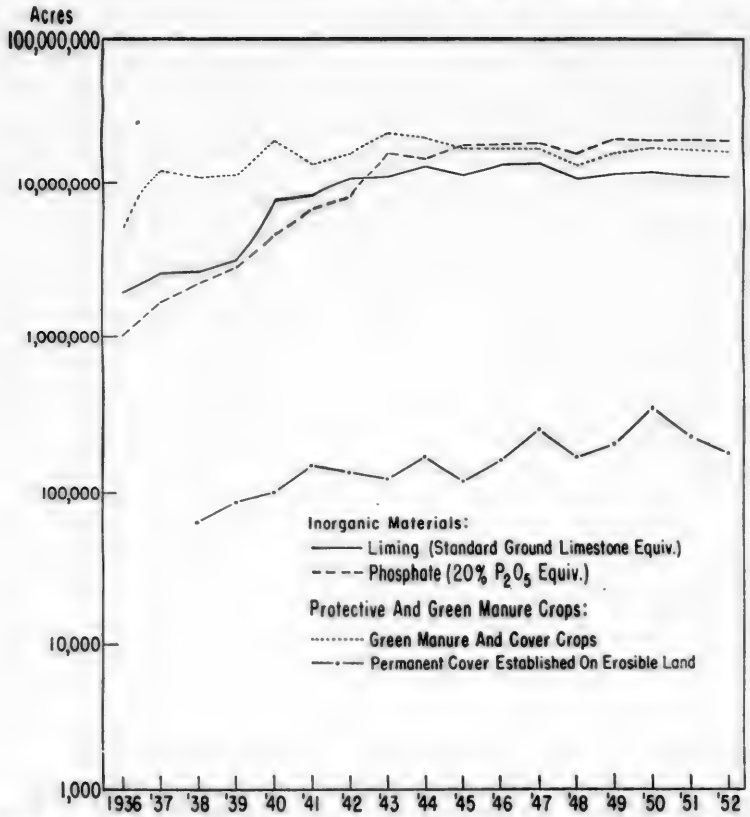

Figure 2. Acreages of Selected Inorganic Materials and Protective and Green Manure Crops Practices Performed Annually for Which Federal Payments Were Made under the Agricultural Conservation Programs, United States and Insular Areas, 1936-1952. Source: U. S. D. A., P.M.A. Agricultural Conservation Programs Branch, *Conservation Practice Summary, 1936-1949,* May, 1951, p. ii; U. S. D. A., P.M.A. Agricultural Conservation Programs Branch, *Statistical Summary, 1950,* Agricultural Conservation Programs Branch, *Statistical Summary, 1951,* November, 1952, pp. 1-5; U. S. D. A., Agricultural Conservation Program Service, *Statistical Summary, 1952,* November, 1953; pp. 2-6.

During the period, 1936-1952, federal expenditures under the classification, "Agricultural Conservation Program," totaled approximately 5.5 billion dollars (8). During this same period, in excess of three billion dollars was utilized by the federal government in payments to farmers of the United States and Insular areas for performing selected soil and water conservation practices.

For the years 1936 through 1943 financial assistance under the programs included (1) commodity payments and (2) assistance for carrying out "conservation" practices (9). For the years 1944 through 1952 the conservation programs were restricted primarily to assistance for carrying out conservation practices.

The average annual total assistance during 1936-1952 under the agricultural conservation programs which included assistance for commodity payments and conservation practices equaled 321.8 million dollars. Payments for the "regular" conservation practices programs, ranging from 60 million dollars in 1936 to 293 million in 1944, averaged 180.7 million dollars annually.

This excludes conservation payments for naval stores which are significant in some of the Southern states, but amounted to less than 1.5 per cent of the national total for the "regular" conservation program for any single year.

Utilization According to Practices

Distribution of funds used for the major groups of conservation practices for the years, 1947-1952, are summarized in Table 1.

It should be recognized that the group of practices listed are not equally exclusive. They vary among the years in the extent to which they are completely definitive. This results partly from convenience in administration and partly from the fact that some conservation problems require combinations of practices for most effective use. Notwithstanding these facts, the published listings by the U. S. Department of Agriculture provide the best available guide for showing (1) use of federal payments for conservation and (2) acreage changes for the major conservation practices.

Inorganic materials practices were credited with over 42 per cent of the funds used for conservation practices during this period. Protective and green manure crops ranked second with approximately 16 per cent. Pasture and range practices equaled

Table 1. Distribution of Federal Payments (Credit Value)[1] for Conservation Practices, United States and Insular Areas, 1947-1952.[2]

Practice	Percent of Total
Inorganic materials	42.41
Protective and green manure crops	15.88
Mechanical erosion control	13.69
Drainage	3.94
Irrigation	3.70
Pasture and range	15.19
Forestry	.38
Miscellaneous	4.81
Total	100.00

[1]In lieu of actual payments data "credit value" data are used in Table 1 and Figure 1. "Credit value" is not identical with the amount of payment or assistance actually given, it represents the amount which would have been used at the authorized rate of assistance if all the conservation practices reported by the farmer were paid for. The credit value is always in excess of the amount of payment actually made; however, the percentages based on "credit value" represent a fairly accurate distribution according to personnel of the U. S. Department of Agriculture's Agriculture Conservation Program Service.

[2]Compiled from annual reports entitled *Agricultural Conservation Program Statistical Summary* for the years 1947-1951, and *Summary* for 1952, U. S. Department of Agriculture, Production and Marketing Administration and Conservation Program Service.

15 per cent of the total. Mechanical erosion control practices ranked fourth with 13.7 per cent; 86 per cent of the funds utilized for conservation practices went to other than mechanical erosion control practices.

A graphic illustration of the magnitude of the "credit value" payments made annually for the different groups of practices is shown in Figure 1. It should be kept in mind that these data are "credit value" estimates as explained at the bottom of Table 1.

Acreage Changes in Practices

The cost-sharing conservation practices are summarized in acreages by means of semi-logarithmic graphs. This permits the use of fewer graphs since acreages of wide magnitude—characteristic of different practices—can be put on the same graph. The practices are grouped according to the classification used by the federal payments programs. The groups of practices are discussed in the following order: inorganic materials, protective and green manure crops, mechanical erosion control, drainage and irrigation, forestry and miscellaneous, and pasture and range.

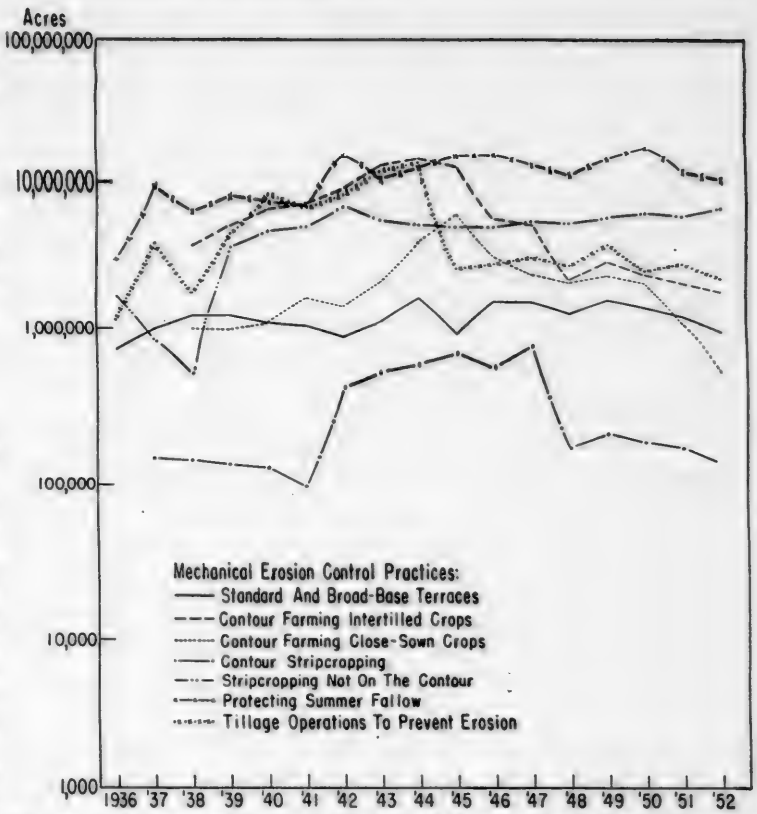

Figure 3. Acreages of Selected Mechanical Erosion Control Practices Performed Annually for which Federal Payments Were Made under the Agricultural Conservation Programs, United States and Insular Areas, 1936-1952. Source: See Figure 2.

Inorganic materials. This classification included as listed in the 1952 *Agricultural Conservation Program Summary* fourteen different chemical practices. The two most significant of the inorganic practices in terms of credit value were liming and phosphating.

The liming practice increased from 2.2 million acres in 1936 to a peak of 14.6 million in 1947 (Figure 2). From 1947 to 1952 the extent of this practice declined to 10.8 million acres.

Phosphating was one of the more widely used inorganic practices. It included such items as superphosphate, rock phosphate, colloidal phosphate, basic slag, and heat fused phosphate. A rising trend characterized this practice from 1936 to 1952. Beginning in 1936 with one million acres, a marked rise occurred to 1945 when 19.6 million acres were phosphated. In 1952, 22.4 million acres were phosphated.

Protective and green manure crops. Nineteen different practices were listed in this classification in 1952. The green manure cover crops summary included ten of the nineteen practices in the 1952 statistics. Winter legumes; summer legumes; sweetclover; alsike and red clover; alfalfa; small grains; annual lespedeza; domestic ryegrass; sorghums, sudan grass, sown corn, and broomcorn; and miscellaneous practices represented the ten enumerated practices classified under green manure and cover crops.

An increase took place for green manure and cover crops from 1936 to 1943 (Figure 2). The acreage used for these practices increased from 5.9 million acres in 1936 to a high of 25.1 million acres in 1943. From 1943 to 1952 a less fluctuating but declining acreage was evidenced.

Permanent cover established on erosible land, not as significant in acreage as the previously combined protective green manure practices, increased from 59 thousand acres in 1938 to 191 thousand acres in 1952. The highest acreage occurring in any single year from 1938 to 1952 was the 360 thousand acres in 1950.

Mechanical erosion control. Classified under this category in the 1952 program were forty-six practices. Some of the selected erosion control practices included terracing, contour farming, intertilled and close-sown crops, contour stripcropping, stripcropping not on the contour, protecting summer fallow, and tillage operations (Figure 3). Practices classified as protecting summer fallow, stripcropping not on the contour, and standard and broadbase terraces experienced less erratic movements

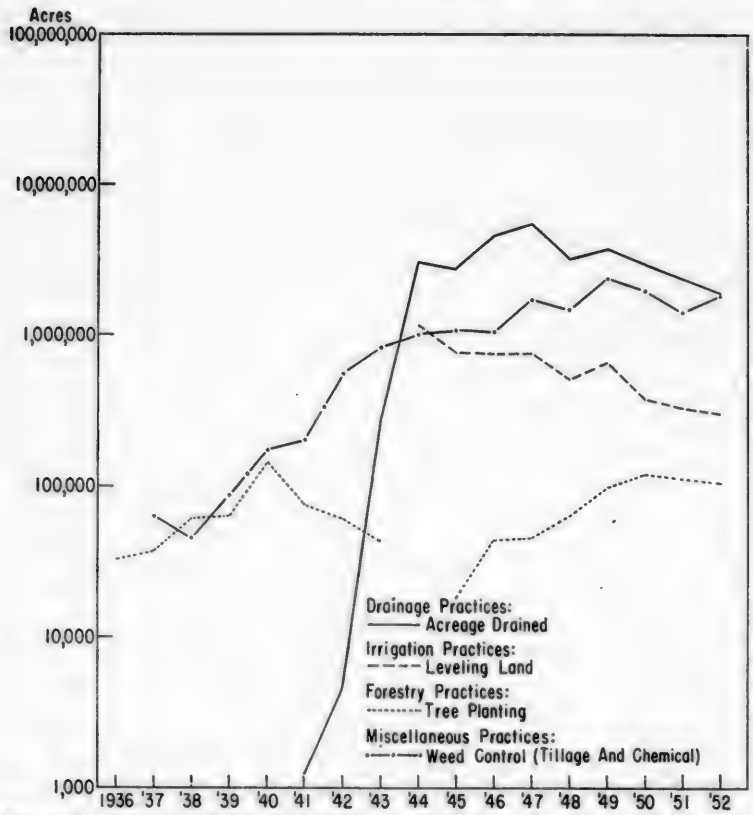

Figure 4. Acreages of Selected Drainage, Irrigation, Forestry, and Miscellaneous Practices Performed Annually for which Federal Payments Were Made under the Agricultural Conservation Programs, United States and Insular Areas, 1936-1952. Source: See Figure 2.

since the 'forties than did the other mechanical erosion control practices.

The practice listed as protecting summer fallow was used on 10.7 million acres in 1952. Generally this practice was the most extensive of the mechanical erosion control practices during the period, 1936-1952. In the peak year of 1950, 15.9 million acres received protective summer fallow practices.

Ranking second in acreage to protective summer fallow practices since 1947 was the practice of stripcropping not on the contour. Experiencing an increase from approximately half a million acres in 1938 to 7.9 million acres in 1942, the acreage utilized for this practice did not decline below six million acres during the following ten years.

The acreage receiving tillage operations to prevent erosion declined from a peak acreage of 12.2 million in 1944 to 2.5 million by 1952. Contour farming intertilled crops dropped from a high of 13.2 million acres in 1944 to 1.9 million in 1952. "Cross-slope" farming acreage which is nearly identical to contour farming is not available for annual summarization.

Contour farming close-sown crops increased from less than a million acres in 1938 to a maximum of seven million acres in 1945. This in turn was followed by a reduction to 598 thousand acres in 1952.

Terracing — considerably less extensive than the previous practices—ranged from .7 of a million acres in 1936 to approximately 1.7 million in 1944.

Contour stripcropping in 1952 totaled 146 thousand acres. This was 16 thousand acres below the 1937 acreage. From 1942 to 1947 the highest acreage years of the period, 1937-1952, the acreage contour stripcropped ranged from 470 thousand to 765 thousand.

Drainage and irrigation. Nine practices were classified under drainage and nineteen under irrigation making a total of twenty-eight practices in this category in the 1952 agricultural conservation program. In 1952 nine of the practices were included in the data summarized for acreage drained. The first year for which data were available (1941) showed the extent of the drainage practice to be quite insignificant (Figure 4). A very rapid expansion from approximately one thousand acres in 1941 to three million in 1944 then occurred. From 1944 further expansion took place to 5.6 million acres in 1947. A reduction then set in to 1952. In the latter year 1.9 million acres were drained.

Land leveling—one of the more important irrigation practices—declined from 1.1 million acres in its first and highest year (1944) to 297 thousand acres by 1952.

Forestry and miscellaneous. In the 1952 program there were seven practices listed under forestry. They were tree planting, planting a living fence, timber stand improvement, maintaining a stand of trees and shrubs in windbreaks, fireguards or firebreaks, clearing land for planting forest trees, and fencing to protect woodland.

The practice of tree planting which is listed as receiving approximately three-fourths of the total forestry funds in the 1952 agricultural conservation program ranged from a high of 145 thousand acres in 1940 to a low of 18 thousand acres in 1945 (Figure 4). In 1952 slightly over 100 thousand acres of trees were planted.

Miscellaneous practices in the 1952 summary are classified as "all other" and as such included twenty-seven practices. Approximately half of the 1952 payments for "all other" practices were used for weed control. Beginning with approximately 63 thousand acres in 1937, this practice increased to a high of 2.4 million acres in 1949

(Figure 4). In 1952 there were 1.8 million acres receiving this practice.

Pasture and range. Of the twenty-six pasture and range practices in the 1952 program, over one-half of the payments went to artificial seeding or reseeding of pasture and range land. Except for a sharp decline to 31 thousand acres in 1937 from an acreage of 1.8 million in 1936, in general this practice increased in scope with the passage of time (Figure 5). In the peak year of 1951, 6.9 million acres received this practice, whereas it had declined to six million acres by 1952.

While extensive in acreage, natural reseeding (by deferred grazing) accounted for only .08 per cent of the total federal payments for conservation practices in 1952. Following a sharp increase from approximately 36 thousand acres in 1936 to 32.6 million in 1938, the extent of this practice declined until by 1952 it equaled 1.1 million acres.

Grazing land management, an extensive practice like natural reseeding by deferred grazing, also represented an insignificant share (.06 per cent) of the 1952 conservation payments. The 1952 acreage of 5.2 million was considerably below the 1946 high of 94 million acres.

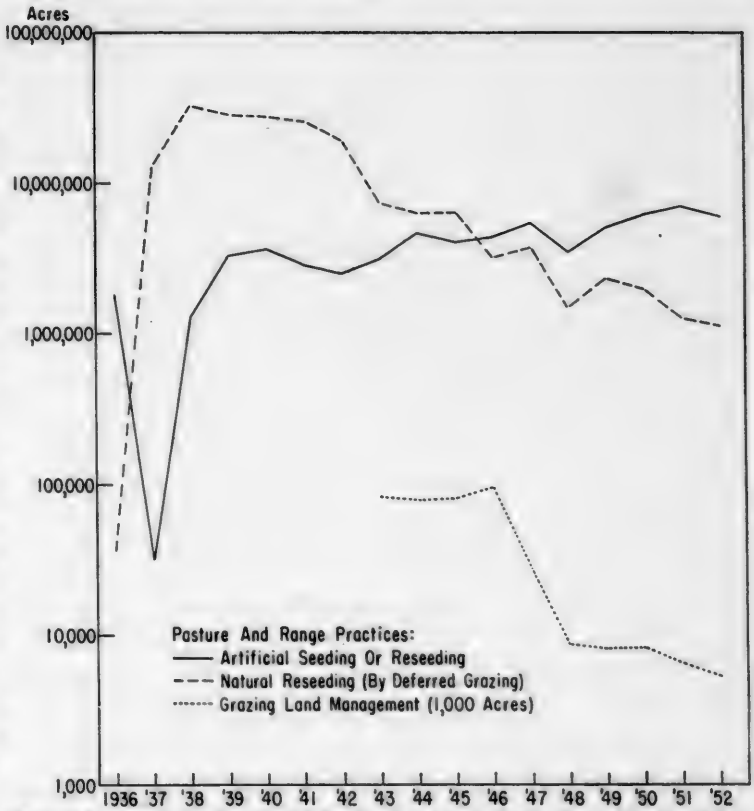

Figure 5. Acreages of Selected Pasture and Range Practices Performed Annually for which Federal Payments Were Made under the Agricultural Conservation Programs, United States and Insular Areas, 1936-1952. Source: See Figure 2.

Summary

In excess of three billion dollars was utilized during the period, 1936-1952, by the federal government for payments to farmers for carrying out selected soil and water conservation practices. The average annual assistance to farmers for carrying out "regular" conservation practices was 180.7 million dollars.

During the period, 1947-1952, federal payments (credit value) for inorganic materials practices equaled 42 per cent of the federal payments for all conservation practices. Inorganic materials represented the most significant group of practices from the point of view of funds expended.

Acreages devoted to inorganic materials practices (phosphating and liming) and protective cover on erosible land practices evidenced a more pronounced rise during the period, 1936-1952, than did several of the major mechanical erosion control practices. Such mechanical erosion control practices as tillage operations, contour farming intertilled crops, contour farming close-sown crops, and contour stripcropping were characterized by declines during recent years.

Although weed control and tree planting practices have been increasing in acreage, drainage and irrigation practices have been declining during recent years. Natural reseeding of pastures by deferred grazing has been declining since 1938. Artificial seeding or reseeding of pastures and ranges has had a generally upward movement in acreage following the sharp drop in 1937.

LITERATURE CITED

1. Foreword by Ezra Taft Benson, *Handbook for 1954 Agricultural Conservation Program Oklahoma,* United States Department of Agriculture, October, 1953, p. ii.
2. Conservation as an idea as well as an ideal started with the creation. In the Book of Genesis it is stated that man should "replenish" the earth as he uses it. To replenish means to "stock anew" or to put back that which is taken out. This ageless moral concept goes today by the modern name of "conservation."
3. The conservation *Handbooks* of the federal payments programs repeatedly define conservation. For typical examples see the *1942 AAA Handbook for Oklahoma,* 1942 Agricultural Conservation Program, United States Department of Agriculture, Agricultural Adjustment Administration, 1941, p. iii; *Agricultural Conservation Program 1951,* Payne County (Oklahoma), United States Department of Agriculture, Production and Marketing Administration, p. 1; *Agricultural Conservation Program Oklahoma Handbook for 1953,* United States Department of Agriculture, Production and Marketing Administration, August, 1952, p. ii.
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(*Continued on page* 249)

A Capability Classification for Forest Land

SIDNEY WEITZMAN AND G. R. TRIMBLE, JR.

Land classification has become standard practice in managing agricultural lands. Now a system for classifying hardwood forest lands according to productivity is proposed. Timber-management practices suitable for different classes of forest land are also recommended.

FORESTS ARE MANAGED, more often than not, with little regard for the variation in the growth potential of forest lands. Too little recognition is given to the fact that different pieces of land, even within the same tract, may grow trees at a much faster rate than others. In this respect, many woodland owners manage their lands today with less wisdom than farmers ever managed open land. Trees grow slowly, and differences in growth are not so readily apparent as with annual crops.

However, there was a time, not too many years ago, when the average farmer used only the crudest rules-of-thumb to break his farmland down into areas best suited to the different types of crops such as open-tilled, close-growing, pasture and forest.

With the development of the Extension Service and the Soil Conservation Service, land classification became an accepted practice. It was followed everywhere by enlightened farmers. This was a tremendous step forward. Among the benefits resulting from this approach were increased crop yields, greater financial returns, a more stable agriculture, and less erosion and sedimentation.

What has been done with agricultural land, we propose be done with forest land. After all, forests too grow under a wide range of conditions, and their ability to produce varies with these conditions.

Before forest land can be managed according to its capability, a system had to be devised for classifying forest land into capability classes. The purpose of this study was: (1) to find the factors that affect the productivity of forest land so that capability classes could be defined; and (2) to recommend timber-management practices that should be applied to each of the capability classes established.

A Study of Land Productivity

In this study, made in the northern Appalachians, site index of oaks was used as the measure of forest land productivity. In farm land, productivity is measured in terms of bales of cotton, tons of hay, or bushels of corn. In forest land, site index has long been used successfully as a standard measure of timber land productivity.

Site index is determined from the average height of dominant and co-dominant trees of a particular species at the age of 50 years. For each site index, foresters have determined the volume of timber a stand can produce at different ages when fully stocked. These expected volumes are put together as yield tables. Once the site indexes are known, they provide a means of estimating yields from different forest areas.

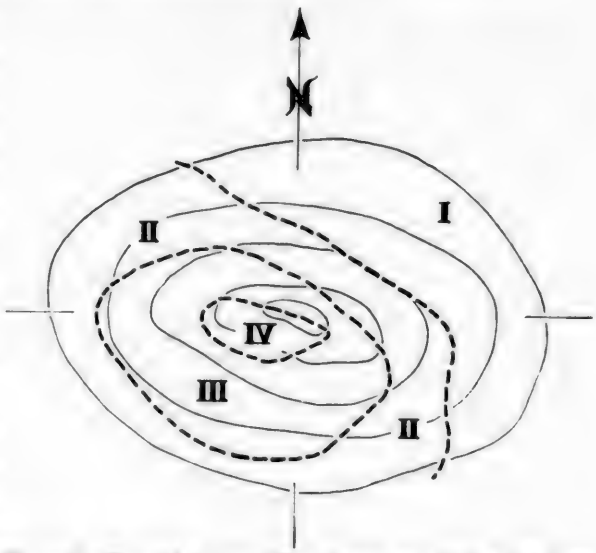

Figure 1. Forest land capability classes on a hill with 40 per cent slope and two feet of soil.

But the conventional use of site index curves for measuring productivity is limited. For site index can be determined accurately only from trees that are growing in well-stocked, even-aged stands. The height growth of open-grown trees or trees growing under conditions of suppression may reflect the influence of spacing and shade rather than basic site productivity. In addition, the stands should be mature enough to reflect the full impact of the site factors.

Many, probably most, of our forest stands fail to meet these conditions. Understocked stands, cut-over areas, restocking pastures, old fields and areas of young timber —all represent unsatisfactory conditions for the conventional height-over-age determination of site index. For this reason a more practical system had to be devised for estimating the productivity of forest land.

Oaks grown in even-aged stands are good indicators of productivity. While they are more numerous under certain conditions than under others, some oaks are found

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on practically all sites. This permits studying the land factors that affect capability over a wide range of conditions. In even-aged stands, oaks that have not been suppressed reflect true site capability. Certain factors affecting the productivity of oak stands were isolated.

At the same time that the even-aged oak stands were sampled to determine site index, information was collected on such features as aspect, position on slope, slope of the land surface, length of slope, humus type and depth, soil series, soil texture, soil depth by horizons, rock content and root concentration.

Then all these physiographic and soils data were analyzed to see if any of these were good indicators of productivity. In that way the individual factors that strongly affect site productivity were determined.

The Results

Four factors were found to be related closely to the site index of oak in the northern Appalachians. *These were: (1) aspect—that is, the compass direction the slope pitches toward; (2) topographic position—that is, whether on a lower slope, a middle slope, a ridgetop, or elsewhere; (3) steepness of the slope; and (4) soil depth to bedrock.* The effect of these four variables on site productivity was determined through a multiple regression equation:

$Y = 1.9702 - 0.0618\ X_1 + .0012\ X_2 - .0020\ X_3 - .1509\ X_4$ in which Y = log site index; X_1 = sine (azimuth from SE) + 1; X_2 = percent distance from the ridge line; X_3 = percent slope of the plot, and $X_4 = \frac{1}{\text{soil depth in feet}}$.

The individual site index values computed from the equation were then separated into four groups. These groups express the relative inherent ability of the area to produce a forest crop:

Site index for oak	Forest land capability class
75 and over	I
65 to 74	II
55 to 64	III
54 and below	IV

This forest land capability classification, based on measurement of oak site index, may be used as an indication of site for other hardwoods. Work in the Southern Appalachians (2) has shown that species that normally grow together react in the same direction as the site changes. On a poor oak site, the growth of the stand will be low regardless of the species. Conversely, a good oak site will maintain a good growth rate for any of the species that normally grow there.

To make the findings readily useful in the field, a table (Table 1) was drawn up covering the combinations of land factors that occur in the area. Once these factors are known it is possible to estimate the capability class direct from the table.

Although Table 1 gives the computed values for any combination of factors, figures 1, 2, and 3 show graphically the relative importance of each factor. They show that:

1. North and east slopes are more productive than south and west slopes. Other things being equal, north and east slopes are about one capability class higher than south and west slopes (figure 1).
2. Productivity increases from ridgeline to lower slope. Again, keeping everything else equal, the bottom of the slope will be about two capability classes more productive than the top of the slope (figure 1).

Table 1. Land factors and capability classes for forest land.

Aspect	Soil depth[1]	Bottom of slope			⅕ distance up slope			⅖ distance up slope			Upper slope		
		Slope per cent			Slope per cent			Slope per cent			Slope per cent		
		0-20	21-40	41+	0-20	21-40	41+	0-20	21-40	41+	0-20	21-40	41+
	Inches	*Forest land capability classes*											
N	13-24	I	I	II	I	II	II	II	II	III	II	III	IV
&	25-36	I	I	I	I	I	II	I	I	II	I	II	III
E	37+	I	I	I	I	I	I	I	I	II	I	II	III
S	13-24	II	II	III	II	III	IV	III	IV	IV	IV	IV	IV
&	25-36	I	I	II	II	II	III	II	III	IV	III	III	IV
W	37+	I	I	II	I	II	III	II	III	III	III	III	IV
NW	13-24	I	II	III	II	II	III	II	III	IV	III	IV	IV
&	25-36	I	I	II	I	II	II	I	II	III	II	III	III
SE	37+	I	I	I	I	I	II	I	II	III	II	III	III
NE	13-24	I	I	II	I	I	II	II	II	III	II	III	IV
	25-36	I	I	I	I	I	I	I	I	II	I	II	III
	37+	I	I	I	I	I	I	I	I	II	I	II	II
SW	13-24	II	III	III	III	III	IV	III	IV	IV	IV	IV	IV
	25-36	I	II	III	II	III	III	II	III	IV	III	III	IV
	37+	I	II	II	II	II	III	II	III	III	III	III	IV

[1]Areas with less than 13.0 inches of soil are all in capability class IV.

3. Increasing steepness reduces productivity. As the slope gets steeper, forest productivity declines (figure 2).

4. Productivity increases with an increase in soil depth. The rate of increase, however, diminishes with increasing soil depth. As the soil depth increases from one foot to two feet, productivity increases about one capability class. Increasing soil depth from two feet to three feet increases productivity less than one-half a class. The effect of soil depth on capability class probably levels off between three and four feet (figure 3).

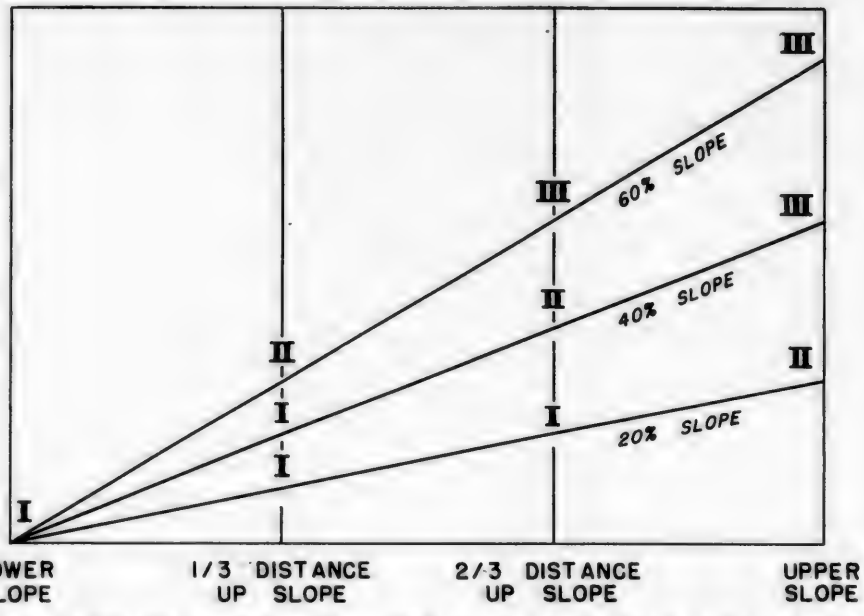

Figure 2. Forest land capability classes according to slope. Soil depth (two feet) and aspect (north) are constant.

The classification shown in Table 1 applies to over 90 per cent of the area studied. Since most of the soils are medium in texture (very fine sandy loam to silty clay-loam), well-drained, and derived from sandstone and shale, most of the plots were taken in this complex and the tables apply wherever these conditions are found in the northern Appalachians.

Where other conditions exist, modification of Table 1 is necessary. These modifications can be made as follows:

1. Where soils are coarser textured (fine sandy loam and sandy loam), add one class to capability classes I, II, and III. Thus I becomes II, II becomes III, and III becomes IV.

2. Also where the soil series is Ashby the productivity is lower, therefore increase the capability class by one. For reasons not clearly understood this particular soil series is a poor soil for tree growth.

3. Where drainage is impeded—that is, the soil has a clayey mottled layer within 12 inches of the surface which lowers productivity, therefore add one to the capability class except for very swampy areas, which should always be classed as IV. (Poorly drained forest land forms only a small portion of the total forest area in this mountain country.)

4. Ridge tops present some conditions not specifically covered in the table. For ridges narrower in width than two chains, the forest land capability class is the same as a SW exposure with all the grade on the upper slope. For ridges wider than two chains, the class can be obtained directly from Table 1. Such ridges are rarely flat, but slope gently, and Table 1 can be used to get the appropriate class.

What the capability classes mean in terms of productivity is indicated in table 2. This table gives volume of cubic feet, board feet, and cords of material that can be grown in well-stocked stands in each forest land capability class at age 50 years.[1]

Table 2. Expected yields per acre by forest land capability classes at 50 years.[1]

Forest land capability class	Expected yields		
	Cubic feet[2]	Board feet[3]	Cords[4]
IV	1,600	3,250	19
III	2,230	6,300	26
II	2,830	9,750	33
I	3,450	13,750	41

[1]Adapted from Schnur (1).
[2]Yield of merchantable stems, including bark, to 4-inch top outside bark.
[3]International rule, 1/8-inch saw kerf, to 5-inch top inside bark, including all trees having at least one 16-foot log.
[4]Including bark to a 4-inch top outside bark.

In the rough mountain country where this study was made, forest land productivity often varies several hundred per cent within a watershed or logging chance. To be effective, forest-management practices should be geared to the productivity level of each area. The following guides to management are suggested for each of the capability classes. These guides must, of course, be adapted to the economic requirements of the landowner and his objectives in management.

Application of Results

Forest Land Capability Class I—The land in this class has the highest potential for growing forest crops. It will

[1]From yield-table volumes from stands in which the oaks predominated.

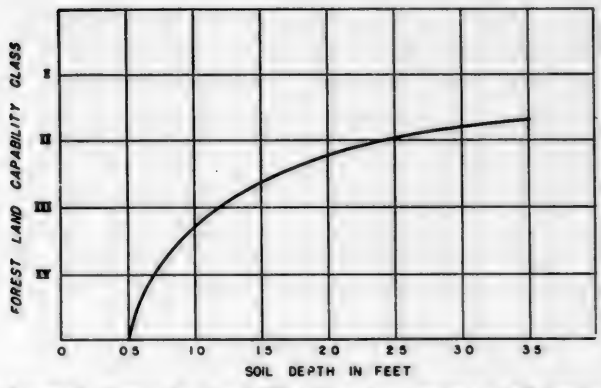

Figure 3. Forest land capability classes according to soil depth. Other factors are constant: 40 per cent slope, one-third distance from bottom, aspect southeast.

carry a relatively heavy capital investment in cultural measures and physical improvements.

Since growth rates are high (Table 2) intensive management practices are economically desirable. This land class can carry a high growing stock level—around 70 square feet of basal area in trees 10 inches d.b.h. and larger—without reducing annual growth of individual trees or risking a high mortality loss. After stands have been under management long enough for the culls to have been removed and a good diameter distribution to become established they can be cut at frequent intervals—every 10 years or even more frequently.

In general, the location and care of logging roads present few special problems. Since these areas are mostly on lower slopes they are apt to be near streams, so care should be taken to locate the roads away from streambanks to minimize sedimentation in the streams. Since short cutting cycles are indicated it will be profitable to locate and construct roads that are suitable for frequent use. Grade standards, drainage provisions, and after-logging care should minimize erosion and insure protection of the original investment.

These are moist sites and they provide suitable conditions for growing the more demanding hardwoods. Such species as yellow-poplar, black cherry, sugar maple, white ash, and basswood are common along with scattered excellent specimens of red oak and hickory. In general, these more demanding species have a higher unit value than the black gum, red maple, and scarlet oak so common on the poor sites.

Forest Land Capability Class II—On the drier aspects —south, west, and southwest—this capability class is found on the deep soils and gentle slopes; or, if the soils are shallow or the slopes steep, it is found only near the bottom of the slopes. On the north and east aspects it is found on combinations of slope position, grade, and soil depth that are slightly less favorable than Class I land.

This class occurs on better-than-average forest areas. A mixture of the more demanding species often predominates but the oaks—particularly red oak—form a more pronounced component of the stand than in Capability Class I. Class II land can support a growing stock of around 60 square feet in trees 10 inches d.b.h. and over. Stands can be cut on a cycle of 15 to 20 years, and permanent road systems are likely to be a profitable investment, as are some cultural measures.

Since slopes are generally steeper than in Land Class I, more care in road location, drainage, and after-logging care is necessary to protect water values.

Forest Land Capability Class III—Most of this land is either steep or has shallow soils—in some cases, both. It is suitable for growing timber, but great care should be taken with roads to protect soil and water values.

Oaks are the most numerous tree species, and scarlet and chestnut oak generally outnumber red oak. Black gum is frequently found here, while sassafras and black locust are often numerous in younger stands. Average unit values of the wood produced are low compared to the better sites that support higher value species.

Though these areas can grow good timber, long rotations are necessary. Intensive cultural measures may not be profitable. These sites will support a growing stock of 40 to 50 square feet (10 inches and larger) on a cutting cycle of 20 to 30 years.

Permanent logging roads may not be desirable because of the long cutting cycles.

Forest Land Capability Class IV—This land is unsuited for the economic production of hardwood timber under present market conditions. Its greatest value may be as a protection forest. The growth rate is too low to pay the taxes. Only for small products or on extremely long rotations is logging ever worth while. The trees are of low value in both species and form. Scarlet oak, chestnut oak, black gum, and red maple are typical species.

There are indications that at least some of the better forest land in this class will profitably grow pine, but this needs further exploration.

Intensity of Management and Frequency of Cut—These items have been discussed briefly under each forest land capability class. However, in application it may be necessary to integrate the practices for several or all classes on the same property or logging chance. For example, in a typical forested hollow or logging chance, the range in forest land capability classes may be from Class I at the bottom to Class IV on the upper slopes. Since such chances are usually logged by one operator in one continuous operation, there is the problem of how to integrate the various cutting cycles and intensities of management into this one operation.

The suggested answer is a zonal or horizontal system of management. The first cut may cover most of the

watershed or logging chance. The next cut will probably be confined to the better capability classes, which are the lower areas. These are more productive and can be logged more often. The lower and middle slopes may be cut once or twice before the upper slopes are ready for another cut.

The management plan should integrate the cutting cycles so that each time the areas with the longest cutting cycle (ridges) are logged, the whole watershed will be cut again. Road systems, cultural measures and marketing practices in each zone will be appropriate for the capability rating of the zone (Figure 4).

Estimating Value of Timber Land—The commercial value of forest land consists of two elements: (1) the value of the standing timber; and (2) the capitalized net value of annual or periodic growth. It has been common practice to base the sale value of forest land on the value of standing timber alone. Only occasionally is the potential annual growth and the corresponding net annual income considered.

The first method is obviously inadequate for estimating the value of timber land. And the second method may lead to error if the present stand is taken as an indicator of growth potential. Because of age, past cutting, fire, or grazing the standing timber may be a poor indicator of the site's real productive capacity.

Expected yields (Table 2) based on forest land capability classes may serve as a better guide to estimating timber land value. And local conditions that affect accessibility, markets, stumpage values, and annual operating and carrying charges will also have to be considered in translating growth potential into annual net incomes and capitalized values.

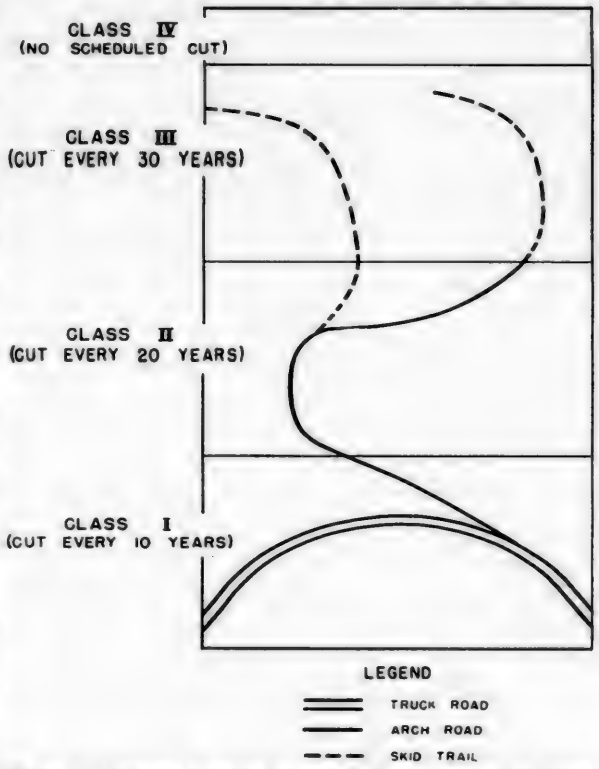

Figure 4. Diagram showing intensity of management by forest land capability classes.

Summary

Following an oak-site study made in the northern Appalachians, forest land capability classes for hardwoods were developed. *Four land factors were found to be closely related to productivity of forest lands. They are: aspect, topographic position, steepness of grade, and soil depth. The effect of certain minor modifying factors was also described.*

These land capability classes can be used as aids in determining the intensity of management practices and the frequency of cutting, and in estimating the value of timber land. The type and intensity of management that is suitable for each capability class is suggested.

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Plant the "Go-Back Land" to Grass

M. D. ATKINS AND M. WERTZBERGER

THERE ARE at least several hundred thousand acres of "Go-back land" in eastern Kansas and perhaps several million acres in the state as a whole. *"Go-back land" is a term commonly used to refer to land that was once "broken out" and used for cropland and later abandoned.* Reasons given for abandoning such land vary but usually it is because of shallow soil, inherently low in productivity, or of steep erosive slopes. Some areas were farmed only a few years whereas others were in cultivated crop production for 20 years or more.

When cultivation ceased, some of these fields were fenced in with adjoining pasturelands, some were not, but seldom was any effort made to seed them to grass. One reason they were not seeded was that many of them were abandoned prior to the time seed of adapted native grasses was available for planting and before seeding methods were established. A second reason was that it was the common opinion that these lands would "Go-back" to the desirable native grasses without any seeding.

Theoretically these abandoned lands will go back to grass provided seed source areas are adjacent. Actually the pattern of land use and the grazing practices on the native pasturelands of the area have been such that good grass seed crops seldom develop. There are many such fields, some known to have been abandoned for more than 30 years, that support little or no desirable grass.

Trial Plantings on "Go-Back Land"

Typical of this "Go-back land" was a field on which trial plantings of several grasses were made cooperatively by the Soil Conservation Service, the Douglas County Soil Conservation District, and the University of Kansas at Lawrence, Kansas. The field is part of a tract known locally as the Governor Robinson Estate, five miles northeast of Lawrence, belonging to the University of Kansas and devoted primarily to a study of animal ecology.

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Soils on the ridge tops are of Peorian loess origin and glacial till and colluvium occupy the lower slopes. Slopes range from nearly level to about six per cent. Water erosion was severe, resulting in a soil loss ranging from six inches to more than two feet over the field. Gullies, some uncrossable with farm machinery, dissect the slopes. The land was farmed for a number of years prior to 1940 in a manner common to the community. It was then abandoned and natural succession or revegetation permitted until 1949. At that time it supported a growth of annual grasses and weeds with prairie threeawn, cheatgrass brome, bindweed, and sunflower dominating.

On April 1, 1949, the field was tilled with a tandem disk. The objective was to kill some of the winter annual grass growth, yet leave most of the mulch on the ground surface and make some furrows in which to plant grass. It was necessary to go around many of the deep gullies and work only where farm machinery could operate. Then plots of one and two acres across the field were planted to single grasses to observe their individual performance. The seed was broadcast by hand and the disk again run over the field with disks set to cover the seed lightly and pack the seedbed surface.

The native grasses included in the trial were Indiangrass, big bluestem, little bluestem, sideoats grama and switchgrass. The only non-native grass used was ElKan Turkestan bluestem. Following the plot plantings of single grass species, an area of 14 acres was planted with a mixture of seed harvested from native hay meadow in

Figure 1. *Left:* A section of a severely eroded field planted to native tall grass mixture showing how effectively the grasses have stabilized gullies up to two feet in depth. *Bottom:* Section of a severely eroded field not planted to grass showing gullies still actively eroding and vegetation made up primarily of dense-flower goldenrod, sticky goldenrod, willowleaf aster, and prairie threeawn.

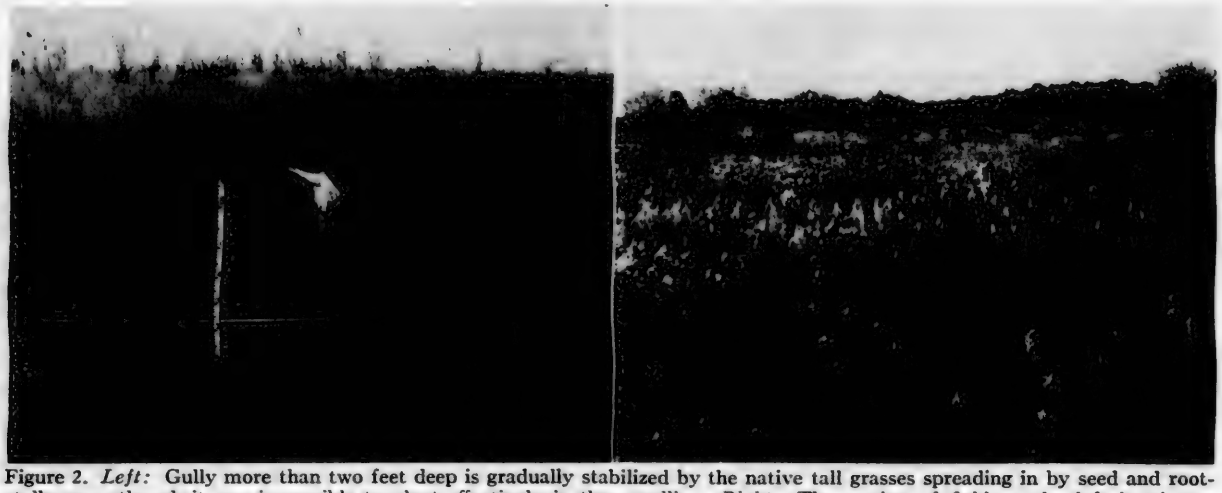

Figure 2. *Left:* Gully more than two feet deep is gradually stabilized by the native tall grasses spreading in by seed and rootstalks even though it was impossible to plant effectively in these gullies. *Right:* The section of field on the left in picture was left unseeded as a check in contrast to that to the right planted with a native tall grass mixture. Unseeded area after 5 years supports practically no desirable grasses but is dominated by brush and weeds.

the vicinity. The mixture composed of big bluestem, little bluestem, Indiangrass, and switchgrass would be known on the commercial market as mixed bluestem. The balance of the field was left unseeded to provide a check.

Planting rates were varied from 6 to 25 pounds of seed per acre in order to apply approximately the same number of viable seeds per acre on each plot. Initial stands on each plot were fair to good and with favorable rainfall throughout the summer the stand and growth was good although plants were typically small at the end of the first growing season. No attempt was made to mow or otherwise control weed growth but livestock were excluded.

Average precipitation for the period 1949-53 of 31.5 inches was a little below the long-time annual average of 35.40 inches for that location. However, precipitation for 1949, the year the planting was made, was 6.12 inches above average. Precipitation in 1950 was about average and in 1951 was 15.28 inches above average. This resulted in an unusually good initial stand and the development of good seed on these young plants in both 1950 and 1951. This seed fell to the ground, moved into the gullies, and has resulted in many new plants on these raw, actively eroding spots. Precipitation since 1951 has been far below average—23.80 inches in 1952, 20.99 inches in 1953, and 31.5 inches in 1954—yet the growth

Figure 3. Portion of an eroded field planted to little bluestem alone showing effective stabilization job it is doing although less effectively than the native grass mixture.

Figure 4. Severely gullied section of the field where big bluestem was planted alone. This grass did a less effective job of stabilization than some other native grass species or the native mixture.

and spread of plants has been very good. In 1954, five years after the planting was done, the native mixture plot has the best stand throughout and has almost completely stabilized erosion including gullies up to three feet in depth. Some of the deeper gullies are still active but stabilization is progressing.

Results Show Job Can Be Done

No single grass species planted alone has done so effective a job of stabilization as has this mixture. Best stand and growth of the single grasses were little bluestem and Indiangrass. ElKan Turkestan bluestem, the only introduced species in this trial, also did an effective job of stabilization. Switchgrass ranked next and big bluestem and sideoats grama were least effective.

The contrast with the adjacent unplanted area was very distinct. There has been little spread or invasion of the desirable grasses into the unseeded portion of this field and erosion is still active. However, vegetation on the unseeded plot has changed through natural succession. The dominant plants now are perennial goldenrods. Other species present in important amounts are willowleaf aster, purpletop, and fall witchgrass. There has also been a greater invasion of brush including buckbrush, sumac, dogwood, and American elm, on the unseeded check area.

In evaluating the results of this trial planting the fact must not be overlooked that moisture conditions were usually favorable the year the planting was done. Observations elsewhere indicate that in years of average precipitation or below a more thorough job of seedbed preparation and planting has been necessary. *Nevertheless, results here demonstrate:* 1) *That seeding "Go-back land" will greatly hasten its return to productive pasture and stop erosion;* 2) *That seeding "Go-back land" is practical and feasible;* and 3) *That a mixture of adapted native grasses is more effective for seeding such areas than is any single species used in this trial.*

"Teamwork for Conservation" in a Virginia County

ERNEST L. GAMBELL

"ARE YOU SAYING that the agricultural agencies and organizations in your county *do* integrate their efforts and do conservation work *together?*" The question was directed to a county group presenting a program, "*Doing Conservation Work Together in Stafford County, Virginia,*" at a meeting of the Washington, D. C., Chapter of the Soil Conservation Society of America. The program was perhaps the climax to the year's theme of the Chapter, "*Teamwork for Conservation.*" The group consisted of Extension County Agent F. S. Tulloss, *Chairman*; Virginia Forest Service Forester G. I. Blain; Agricultural Stabilization and Conservation County Committee Vice Chairman J. F. Edwards; Tri-County Soil Conservation District Supervisor H. R. Greenlaw; Soil Conservation Service Conservationist G. L. Rigby, and Stafford County High School Vocational Agriculture Instructor H. C. Rucker.

Stafford County includes Potomac tidewater, coastal plain, and Piedmont country, with a variety of crop, livestock, and woodland enterprises—and is in the area where George Washington grew up.

The county group had just told a convincing and heartening story on how they take the public programs dealing with conservation and better land use in general and work together cooperatively with Stafford county farmers to translate the programs into action. Group representatives insisted that their cooperative efforts are not unusual, that they believe most county groups of agricultural workers cooperate quite effectively, and that the method pays in service to farmers and good results for the public.

Each participant made a very brief statement on the service his agency or organization offers to farmers and gave an example or two of how representatives from the county group had cooperated in service to individual farmers or groups.

Agency Resource Activities

The dissemination of research findings was referred to as a responsibility of the Extension county agent and of the Vocational Agriculture instructor. They use various methods to see that farmers and students learn about and use better farming and soil and water management measures. (The local newspaper and radio station carry special farm programs and, thereby, join in such efforts.) Likewise, they help develop and put into effect methods of informing farmers of programs or resources that can help them make better progress toward accomplishing their land and water conservation goals. These educational agencies constantly seek to bring about the establishment of such goals by bringing farmers to recognize the conservation problems on their farms, stimulating them to want to do something about them, and helping them to develop some of the skills needed to plan or install or at least to understand, the needed measures. One phase of this effort is directed through the projects and demonstrations carried on by 4-H Club and FFA members.

Ernest L. Gambell, a past vice chairman and past program chairman of the Washington, D. C., Chapter, SCSA, is an agriculturist on the staff of the Administrator, Agricultural Conservation Program Service.

The member of the board of supervisors of the Tri-County Soil Conservation District pointed out the soil classification, farm planning and other technical and cooperative services were provided through district facilities, largely but not wholly under agreements with the Soil Conservation Service. Covering three counties, the district has opportunity to help marshal conservation services on an inter-county basis and to exchange ideas developed by the various county groups. Its facilities are available as a service to help bring together and to encourage cooperative utilization by farmers of the various conservation resources available to them.

The work unit conservationist and the Virginia Forest Service forester outlined the technical services that they respectively provide farmers. They discussed the opportunity for a farmer to use the Soil Conservation District facilities to help him develop a comprehensive conservation farm plan and receive technical guidance in doing first things first and integrating farm woodlot resources into the total farm economy through a system of sound management of farm woodlot and of soil and water. They pointed out also how they perform technical services in their respective fields for participants in farm credit plans and the Agricultural Conservation Program.

The vice chairman of the Agricultural Stabilization and Conservation county committee pointed out the opportunity for farmers to utilize Agricultural Conservation Program cost-sharing on a farmer-government partnership basis, to help them get experience with new and better conservation practices and make greater progress in attaining their farm plan conservation goals, including the sound treatment of acres "diverted" from their allotment crops. Various ones indicated how they encourage farmers with whom they work in their respective programs to make greater progress by utilizing a desirable combination of sound agricultural credit, ACP cost-sharing, where applicable, and their own resources.

Most of the participants cited instances in which they have utilized their knowledge of the various programs, in providing better service to the farmers with whom they work. They keep themselves informed on those programs, they said, by frequent formal and informal conferences or exchanges of information. That is facilitated by the fact that all of them except one have their offices in the same building.

Reaching Farmers Through Community Clubs

Different speakers referred to community improvement clubs as one of their most effective "vehicles" for carrying program information to farmers. Several of these clubs have been organized in the county, primarily under the leadership of the Extension county and home agents. Programs of interest to the membership are "presented" at club meetings in order that the members may know better how to utilize available resources in their farm and home improvement efforts. As an example, a team from the agencies had recently presented the 1955 Agricultural Conservation Program for Stafford County and reviewed various other program services at meetings of three of the clubs.

Following their brief statements, the group proposed that the Chapter members ask any questions in which they might be interested on how the county group carries on its work. A very lively and informative question and discussion period followed—with assurance, including numerous examples, to the varied membership of the Chapter (representing about 20 governmental services or bureaus) and various other persons present that *"teamwork for conservation"* does work—and gets results in Stafford County.

NOTE: *The interest in and the success of this program of the Washington, D. C., Chapter would suggest the possibility of having a similar group, recruited locally, present a comparable story to other chapters or groups interested in conservation.* EDITOR.

Photo Soil Conservation Service

Agricultural lands on which conservation measures have been applied.

Measures Needed to Manage Watersheds . . .

A watershed includes all the land and water area draining into a stream course, a lake, or the ocean. It may be large enough to include many states or even countries or small enough to be covered in a short walk. It may be drained by a major river system or a gully that runs only during rains. Whatever its size, its drainage pattern, its cover, or its occupancy, a watershed is a physiographic and hydrologic unit. As such it forms a natural area which constitutes a logical unit for water and related land management.

Control of water is needed for several reasons. All relate to the fact that we require water for a variety of uses and that too much or too little water or water that is too dirty at times does us harm.

Nature's way of managing water flow does not always meet our needs. Floods are natural phenomena, but the damage they do in developed areas and the water they waste have led to tremendous efforts to control them. Most streams run far higher in spring than in late summer and fall. Our needs for water are greater in summer and fall than in spring. This has led us to store high flows, which would otherwise be wasted, and release them later when they can be used. Soil eroded from hill lands built our highly productive valleys ages ago. Now that these valleys and hill lands are under intensive use, continued soil deposition often of subsoil material, has damaged them. We must prevent this erosion.

Our use of the land has upset certain hydrologic processes. We have cleared millions of acres of forest in the East and replaced this protective soil cover with intermittent covers of cultivated plants. We have stirred the soil and trampled it, breaking down its naturally porous structure and making it less absorptive of water and more susceptible to erosion. We have drained swampy land, which reduces its capacity to detain high flows, and thus allows water to flow faster into streams. Our herds and flocks have grazed so heavily in some places that forage plants are now too sparse to protect the soil against the beating of rain. We have logged forests with little attention to soil protection and we have burned timber and brush lands, increasing surface runoff and the sediment load of streams. We have crowded against river banks and built on outwash plains, leaving only normal-flow channels for high flows that otherwise would spread themselves outside the

Photo Soil Conservation Service

Farm ponds constructed as part of the conservation program provide water for stock, recreation and other farm uses.

Photos Soil Conservation Service

Top: Open ditches are effective in providing field drainage. *Bottom:* Outlet drainage channels are necessary to dispose of excess water from wet lands.

channels. We have dammed rivers and changed their flow regime so that channels below the dams have been scoured, thus releasing fresh loads of sediment to the flowing water. All these activities of ours have produced conditions which call for various remedial measures to control water and stabilize the land.

Although our use of watershed land may have aggravated water-control problems we shall continue to use it in most places. Only relatively small areas, such as those in National Parks, are reserved against the growing of crops for harvest. And only in a few other places is the topography so rugged or growing conditions so poor that little use will be made of the land. Over most of the nation agriculture, grazing, and timber production are permanent and necessary uses of our land and water resources. *This means that water control and land use must go hand in hand.*

The Management of Watersheds

In managing watersheds we have several objectives: to make the most effective use of water on the land and in channels upstream, to deliver downstream the maximum quantity of usable water each year, and to provide facilities downstream for effective control of water delivered there. The concept of usable water is important in all aspects of watershed management. In terms of crop production, usable water is that which enters the soil, not that which flows on the surface and carries soil with it. In terms of downstream delivery, usable water is that which does no damage, is of high enough quality to be used as needed, and is available for use when and where it is needed. Thus, for downstream uses, within or outside the watershed, usable water can be increased by reducing flood flows that do damage or waste water, by reducing the sediment load of streams, and by storing high flows for later release. It can also be increased by reducing evaporation losses upstream, but only if the resulting increases in delivered water are usable.

For most effective watershed management our work on upstream lands and in upstream channels must be planned together and they must be integrated with downstream work. Major reservoirs are required downstream in many places to store water, provide flood protection, and generate power. Sediment produced by erosion upstream shortens the life of such reservoirs. Heavy surges of streamflow, often increased by surface runoff on headwater lands, impair reservoir operation. Reservoir operation is facilitated therefore by any activities upstream that reduce erosion and the peak flows of streams. Similarly, all water control problems cannot be solved by upstream work alone, whether in channels or on the land. Floods will occur even on land that has the best possible protective

cover. Some channel scouring can be expected even with the best erosion control measures. Even under the best possible upstream management, additional work is required downstream to control water to many purposes. *The watershed is a hydrologic unit; its full management requires coordinated work from its headwater lands to its mouth.*

Management of Forest and Wild Lands

Protection, repair, and improvement are the key words in watershed management. On the nation's wild lands, protection consists of preventing and controlling fires, providing for the moderate use of ranges, using adequate drainage and erosion control on roads, and managing logging operations to minimize the soil damage from removing logs. Repair includes the revegetation of burned land; reseeding of depleted ranges, supplemented by better grazing practices, and, in places, contour furrowing and gully control; improvement of water and erosion-control facilities on roads; and cross-ditching or otherwise breaking long bared slopes in logged areas.

Improvement of waterflow conditions on wild lands is something for the future. Research may show that there are opportunities along this line. It appears possible, for instance, to open high-elevation forest stands in patterns that will slow snow melt and thus reduce the spring flows of streams and increase flows later in the year. Replacing deep-rooted plants with shallow-rooted ones that draw less water from the soil will reduce evaporative losses and thus release more water to streams. In western North Carolina the careful but heavy cutting of a hardwood forest has increased water yield substantially without increasing erosion or storm flows. It may be possible to cut vegetation along stream channels and thus decrease the normally high water losses there. These and other possibilities offer a stimulating challenge to research, because they open new vistas in land management for water control.

Photo Soil Conservation Service

Irrigation laterals are used to distribute water to the crops to be irrigated.

Management of Agricultural Lands

On the nation's agricultural lands, management includes conserving soil and water, increasing the per-acre agricultural forage and crop production, stabilizing upstream gullies and channels and controlling excess runoff from the uplands, thereby reducing floodwater damage.

Measures and structures generally may be grouped according to the way they are used in a watershed program.

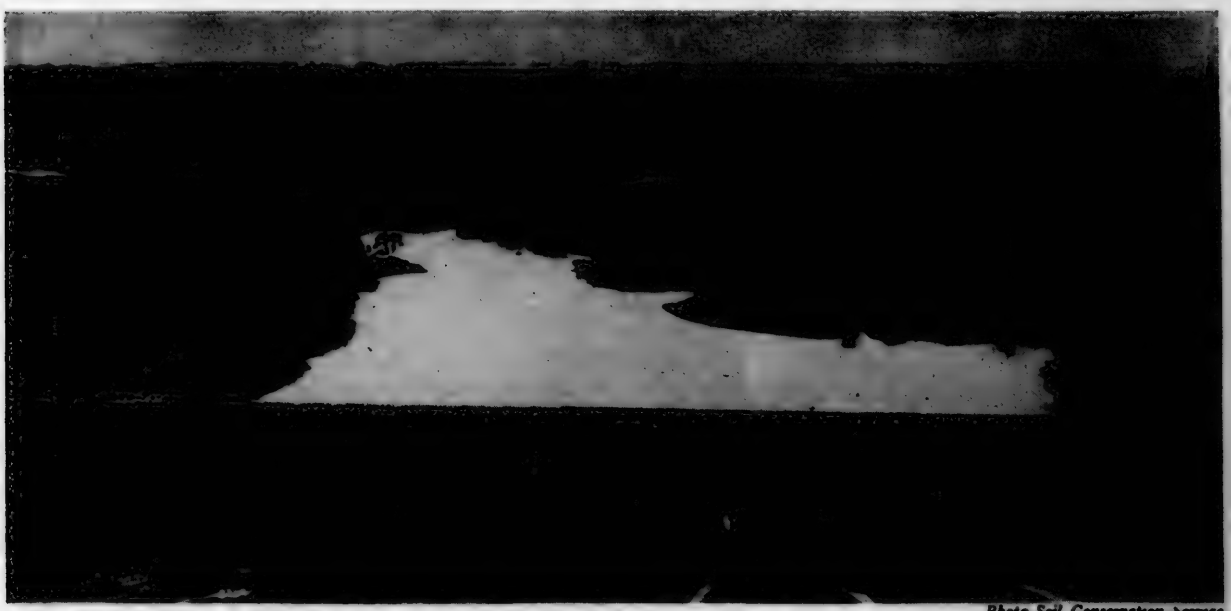

Photo Soil Conservation Service

Excess floodwaters are temporarily stored in floodwater retarding structures to prevent flooding. The water is released at a slow rate.

Photo Soil Conservation Service

Channel enlargement and rock riprap to protect eroding banks are effective channel control measures. *(Work in construction stage.)*

Starting with the fields that make up a watershed, land-treatment measures are used to conserve soil and moisture and for other purposes. They consist of terraces, contour cultivations, cover crops, stripcropping, grass waterways, pasture and woodland improvement, and measures for the control of gullies and small channels.

Water running from the lands has over a period of time formed channels and natural floodways. Waterflow control measures are located in these channels and floodways to regulate stream flows. These measures include floodwater-retarding structures; clearing; straightening and enlarging stream channels; levees and dikes; debris and desilting basins; floodways; diversions, and other special purpose measures, such as water-spreading devices.

The proper management of watershed lands requires drainage and irrigation measures. Drainage measures are used primarily to produce more forage and crops. These measures include the construction and rehabilitation of natural and artificial channels, open or covered drains, and all of the appurtenant control and stabiling measures, such as drops, checks, flumes, control gates, and pumps. But the use of such measures must always be weighted against losses such as destruction of fish and wildlife habitat. Irrigation meaures are provided primarily to supply supplemental water to land and to make efficient use of the water that is supplied. These measures include land leveling, borders, and distribution systems. Structural measures are required, such as diversion dams, wells, pumps, flumes, pipelines, and control structures.

These are the upstream watershed measures. Downstream on the major river channels additional control structures may be needed. Such structures are used primarily to control major floods, store water, and regulate stream flows for navigation, power, irrigation, municipal supply, pollution abatement, and other purposes. These works include major river dams, levees, channel construction, and improvement and regulation structures.

The development and protection of any individual watershed should be related to needs of the local people, the communities, cities, state, and to the national welfare. The size and location of the watershed and the perplexity of problems and needs dictates to a large extent the participants in a watershed project and the degree of participation.

Some general criteria are applicable to all watershed development and protection. These would include (1) land use and treatment designed to conserve soil and moisture, natural vegetation and wildlife, and maintenance and improvement of the agricultural production base, consistent with the best interest of the farmer, rancher and timber producer and the welfare of the Nation; (2) land improvement and upstream water control designed to stabilize gullies and channels, and reduce floodwater and sediment damage on tributary flood plain lands; (3) drainage and irrigation to increase the efficiency of agricultural land production; and (4) control of major floods, storage of water, and the regulation of stream flow by dams and other improvements on major rivers.

Photo Soil Conservation Service

Tree planting for reclamation of gullied land.

Competition, Key to Soil Conservation Teaching

DICK WILSON

LATE LAST APRIL approximately 850 students, observers, agricultural leaders and workers met at the new "Sooner" state fairgrounds to be briefed on land in general and soils in the Oklahoma City area in particular. The occasion was a land appreciation school—kickoff to the first international land, pasture and range judging contest, fourth annual land judging contest and first national pasture and range judging contest.

Participants in the school came from 25 different states scattered throughout the nation. Thirty-nine agriculturists from ten foreign countries were present to learn land judging techniques that could be used in their home countries.

There, too, to learn more about soil conservation training through land judging contests, were extension conservationists and soil conservation service personnel from twelve states. Also, Humber Valley Conservation Authority field officer, K. C. Higgs from Ontario, Canada, was there to study the training method.

FFA and 4-H members came north from Georgia, west from South Carolina, east from New Mexico and south from Minnesota and the Dakotas to compete for placques, medals and some $2,200 in prize money donated by radio station WKY and Television station, WKY-TV, Oklahoma City, Oklahoma.

Some of them were returning for the third straight year, but there were many who first set eyes on Oklahoma soil when they arrived for the contest. And that was one of the reasons for the land appreciation school on Thursday afternoon before the Friday contest—to give out-of-staters a chance to become familiar with local soil profiles, erosion conditions and other judging factors before the national contest got underway.

Well-planned and competently organized, the national contest was the climax for contestants who had earned the right to compete by winning district and regional contests. This year, entries were limited, and each individual had already won championship honors in at least one previous land judging event. The 600 participants composed the top echelon of an estimated 130,000 individuals trained in land judging in 1954.

The months of work that had been spent preparing for the event became more and more apparent as the five separate divisions fit neatly into a pre-arranged judging pattern, functioning smoothly, as adults, collegiate, 4-H, FFA, and women and girls' groups moved from one field to another.

An assembly line method of grading scorecards started with messengers who picked up the cards after contestants had judged each site. The cards were taken to graders, then results were entered on a master sheet. Finally, individual scores were tabulated together, and the top three scores on each team were added to get team ratings. Within three hours after the last person had made his final decision, individual and team results from all divisions were announced.

In the meantime, contestants listened to a top-notch western band and enjoyed a barbecue beef lunch provided by Oklahoma City businessmen.

If any were there who doubted land judging ability of individuals from other regions or adaptability of the scorecards, their misgivings must have been abated some-

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Figure 1. *Left:* Land judging scorecards simplify the teaching of soil fertility factors and land classification. Young club members join in the contests with the same enthusiasm they show in a baseball game. *Right:* Good farm wives in the making, these 4-H girls are participating in the national land judging contest at Oklahoma City in April.

Figure 2. Pasture and range judging incorporates features of land judging, stresses inter-relationship of soil fertility and grass production. A typical scene at the national contest.

what when awards were presented to the winners. Indiana, Minnesota, Kansas and Oklahoma had teams in the top three 4-H and FFA divisions. John Hanaway, Chili, Indiana, was top 4-H individual. He was also on the championship team. A Bertha, Minnesota, team led by Richard Wirth won second place honors in the FFA division. Coyle, Oklahoma, was first, and one of the team members, Joe Downey, was high individual.

But there were no losers, for the primary goal of teaching soil and water conservation principles, especially to the nation's youth, had been accomplished. All the official visitors to the event were impressed by effectiveness of land judging as a conservation teaching tool.

J. H. Herbert, Jr., extension soil conservationist from Florida, said he intended to introduce land judging in that state on a large scale in 1955. Similar statements were expressed by Jim Robinson, Tennessee soil conservationist, and Alfred K. Mathieu, agricultural official from Temico, Chili, who invited Roberts to attend a land judging event to be scheduled in that country sometime in 1961.

A group of extension soil conservationists headed by W. R. Tascher, Washington, D. C., met Thursday evening following the contest to consider any changes and improvements that might be made. The only suggestion offered was in conducting the collegiate division. Some suggested that it be made more technical, thus making a different contest for this one division. A study is now being made to determine if and how this should be done.

A review of the contest method of training the past few years shows tremendous strides in all other divisions. The scorecard has undergone 36 revisions since the first large scale land judging contest was conducted at Pauls Valley, Oklahoma, in 1946, by soil conservationist Sam Lowe and county agent Alton Perry. The first land judging event was held on the Red Plains experiment station at Guthrie, Oklahoma, in 1941.

Some thirty states now are using the training method, according to Ed Roberts, Oklahoma soil conservationist, and author of a recently published book on *Land Judging*. He credits this popularity to simplicity of the scorecards, and their adaptability, with minor alterations, to nearly any region in the United States.

Roberts, Clarence Bunch, extension range specialist, and Dick Chiles, extension pasture specialist, used the same principles in developing scorecards for pasture and range judging, a contest that was held in conjunction with the national land judging event this year.

The scorecards can be used on our western ranges, smaller pastures or on fields to be re-established in pasture. Emphasis is placed on relationship of well-managed pasture and ranges to soil and water conservation. Introduced less than three years ago, pasture and range judging has spread across the country like a prairie wildfire. Fifty-three 4-H and FFA teams from Tennessee, Kansas, Nebraska, Indiana and Oklahoma competed in the first national contest this year.

Dr. L. I. Jones, former federal extension pasture specialist and now extension field representative, said it is one of the few programs that has the backing of every agricultural organization both in and out of government.

At a meeting of top range management officials April 29, agricultural leaders from half a dozen states praised the contests, and many laid plans for introducing their use in conjunction with grassland management work in their home areas.

They were particularly impressed with practicality and versatility of the judging scorecards, but one sug-

gestion was made for improving them. Bunch suggested arranging the scorecard so it would have a section devoted to the stocking rate of each pasture or range to be judged.

Well-planned and skillfully conducted, both contests were considered a success. Fifteen agencies and seventeen committees cooperated in laying the groundwork that made them so.

All agreed that competition, the factor that has made United States athletes the greatest in the world and created the highest standard of living ever known in the history of mankind for the American people, also is one of the best tools in teaching soil, water and grassland conservation. Destruction of our natural resources is a matter of public concern, and our agricultural leaders believe land and pasture judging is a potent weapon for awakening the American people to the seriousness of poor soil and grassland management.

Transplanting Training Methods to Foreign Soils

LOYD M. ADCOCK

YOUNG PEOPLE clad in colorful jackets and fancy shirts, cowboy hats, blue jeans and boots, a western band, and food served by the nationally-known outdoor chef, Clay Potts of Oklahoma Agricultural and Mechanical College—all this color might have been the background atmosphere surrounding a sports event. It was just part of the many experiences which so impressed 40 FOA sponsored foreign technicians from 11 countries who attended the National Land Judging Contest held in Oklahoma April 28-29, 1955, conducted by the Oklahoma A and M College, United States Department of Agriculture Services, county agents, vocational agriculture teachers, and soil conservation districts working together under the principal sponsorship of Television Station WKY-TV and others. Agriculture students from 25 states met to match their skills in judging the land on which they live.

The FOA-USDA committees planning the programs for the foreign visitors, alert to discovering better methods for teaching in agricultural fields, found in this "on-the-ground" classroom a common language for a study of the soil. Here, soil crumbling through many hands, soil appreciation studies of capabilities and land treatments were living realities.

Forty foreign agriculturists met at the A and M College to receive a three-day orientation and advance training in judging in preparation for attendance at the National Contest held at Oklahoma City's New State Fairgrounds. They had three objectives for attending the Land-Judging School and Contest:

First: To learn the system used by the Soil Conservation Service in placing soils into eight land capability classes, each of which is good for certain uses when protected by good conservation measures.

Second: To study and observe the mechanics of conducting a land appreciation school and contest.

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Figure 1. Foreign visitors studying a section of soil profile; also soil structure, permeability and erosion.

Third: To find a teaching method that each could take back to use in his home country to train other agricultural workers to teach farmers accustomed to ancient processes, to use their land in such a way as to sustain life for the present and future generations.

During the orientation the group learned how Americans have taken the mystery out of soils through the use of the land capability classification system, which embraces soil type, physical character, slope, degree of erosion, and land use.

At Oklahoma City each contestant judged four fields of land, recording the results on contest score cards. The actual judging was done similarly to livestock judging.

Although the foreign group did not compete against American groups, representatives from each country were given recognition for their participation in the contest and a great ovation from the 1,500 people in the audience. P. A. Sugg, manager, and Jack Stratton, farm editor of WKY-TV, presented trophies, medals, and cash awards to the winners among the 800 boys and girls and

Figure 2. Eleven foreign countries are represented in this group of technicians that took part in the National Land Judging Contest held at Oklahoma Agricultural and Mechanical College.

adults who participated. Contesting groups included FFA Teams, 4-H groups, Collegiate teams, individuals, and the Women and Girls Division.

Land Judging Has World Wide Application

These 40 foreign visitors, made up of soil conservationists, extension workers, vocational agriculture teachers, and research technicians, all regard the contest as an excellent situation method of teaching which can be applied in any country in the world. Without exception, members of the groups from Bolivia, Chile, Colombia, Ecuador, Greece, Honduras, Indonesia, Madagascar, the Philippines, Spain and Turkey, were impressed by the way Americans have combined the teaching of a "dry" subject with a "sport" in developing this teaching method called a National Land Judging Contest.

In analyzing the contest and in discussing ways of modification as it would be applied in their own countries, a variety of ideas was advanced.

The Spaniards said that making a sport of the event was similar to plowing contests held in Spain.

Many agreed that the outdoor classroom with demonstrations was a type of primitive educational method, excellent for dealing with unschooled people who are "thing thinkers" to whom the principle of teaching must be "according to nature."

One visitor from the Near East remarked, "If you teach peasants, it is a hard job to teach them the right method for they are used to doing things the wrong way. Many people have given our villagers ideas, both right and wrong. They are illiterate and believe what everyone says." In soil judging schools and contests only fundamental facts are taught.

Land judging contests are "interest getters" according to the expression of Turkish visitors who think they "prepare people to absorb new knowledge in soil conservation."

A technician from Ecuador said that, "With this kind of teaching we can stimulate people to apply improved practices and to preserve the land against erosion and eliminate bad management."

Representatives from Bolivia, Chile, Ecuador, Greece, the Philippines and Madagascar found the organization a source of wonder. They were amazed at the ease with which a crowd of 1,500 or more were instructed, fed, and moved to different locations as the contest progressed. They considered the swiftness of calculation and tabulation of contest rules little short of magic.

Many felt that the problem of solving approach in teaching was one of the outstanding elements in this situation method of teaching. In judging, the participants analyzed the land and determined its capabilities, proper use, and decided on mechanical treatments, fertilizers, and soil amendments necessary for the different land classes in order to bring them to a stage of economic production.

Land Use in Lebanon

HOWARD J. FERRIS

THE REPUBLIC OF LEBANON is a small mountainous country located on the eastern rim of the Mediterranean Sea, bounded by Syria on the north and east, and by Israel on the south. It is endowed with a colorful history, dating back to early Phoenician times. Here, Christians and Moslems live in peaceful proximity, sharing their mutual responsibilities as citizens. Beirut, the capital, is the largest city and principal seaport.

Figure 1. A terraced area in the Lebanon Mountains. Apple trees will be planted on the newly constructed terraces to the right. Olive trees can be seen on some of the older terraces.

Lebanon has a land area of approximately 4,000 square miles, extending 115 miles in length, with a maximum width of 45 miles. Of this, no more than 25 per cent, or 640,000 acres, is under cultivation, with about one-fifth of the cultivated land being irrigated. The remainder of the country consists largely of rocky mountainous terrain not well suited for crop production. With a population of 1,300,000 (one half acre of arable land per capita), the pressure on land resources is great. Despite the limited amount of arable land, agriculture plays a major role in the economic life of the country, with about 50 per cent of the people being directly or indirectly engaged in this enterprise. Old and new methods may often be found working side by side. It is not unusual to pass a farmer and his Biblical team of oxen plowing with a nail or iron shod plow such as his ancestors used during the days of Christ. His wife may follow behind broadcasting wheat seeds by hand. At harvest time the wheat is cut by hand, loaded on donkeys or camels, and taken to the village threshing field. All through the early summer, workers ride over the wheat on a flat wooden sled, the underside of which is imbedded with small stones to cut the grain. The sled is pulled by a team of oxen or by a donkey and an ox. The wheat is separated from the chaff by winnowing when the first breeze comes. On the same threshing floor it is not uncommon to see an imported hand or machine operated threshing machine. Modern tractors and plows break fresh soils near a field where a peasant has paused to move a rock from the path of his nail plow.

While small in area, Lebanon is extremely variable in physical make up. The principal physiographic features consist of a rather narrow coastal plain; twin parallel mountain ranges—the Lebanon, lying adjacent to the coast, and the Anti-Lebanon in the east; with the Bekaa valley lying between the two ranges. These areas will be discussed separately due to the wide variation in physical and climatic characteristics, which in turn are reflected in diverse patterns of land use.

The Coastal Plain Area

The coastal plain of Lebanon is rather narrow and discontinuous. The widest sector is located in the Akkar district in the north, where it extends inland for a distance of about six miles. Other sizeable areas occur in the Tripoli, Beirut, and Sidon-Tyr sectors. In many localities the Lebanon mountains rise abruptly from the sea. The coastal plain has a semi-tropical, Mediterranean type of climate, with an average annual rainfall of 30 to 35 inches, all of which falls in the winter and early spring. Topography varies from flat or very gently sloping in the wider portions of the plain, to moderate or steep slopes near the foothills of the mountains. The soils are formed from alluvium washed from the Lebanon range, and are, for the most part, uniform dark brown or reddish brown, deep clay loams and clays. There are few areas of sand dunes along the coast, aside from a rather large tract near Beirut. The latter area is largely barren, and is subject to drifting from the prevailing westerly winds. Relatively small areas have been stabilized by the pine groves, and recently an attempt is being made to prevent drifting by planting grasses.

Much of the arable land of the coastal plain is irrigated from streams and springs originating in the Lebanon mountains. The land is intensively cultivated, with bananas, citrus, and vegetables being the principal crops.

Howard J. Ferris, a member of the USCA, is a soil scientist with the Bureau of Reclamation, Department of the Interior, on assignment with the U.S. Foreign Operations Administration in Lebanon.

Figure 2. Plowing the rocky lands of the Upper Nabatiye Plateau prior to planting wheat.

The Akkar district is not farmed as intensively as the rest of the coastal plain due to the lack of development of the water resources for irrigation. Wheat is the dominant crop in this area, with sugarcane, peanuts, cotton and mixed vegetables being grown on irrigated lands. Olives are a major crop on the dry lands south of Beirut.

Cultivation in the irrigated areas is done largely by hand, with a pick type of implement being used. The practice of mixing sand with the heavier clay soils to facilitate water infiltration and tilth is a common practice. Beach sand is spread over the surface soil to a depth of several inches, and is incorporated into the topsoil to a depth of a foot. Limited amounts of animal manure and chemical fertilizer are applied in a similar manner. Due to the relatively small livestock population, applications of animal manure are usually small. A common practice is to utilize animal excreta for fuel, and later apply the ashes to the soil. The latter practice is customary throughout the country. Windbreaks of Cypress, Tamarisk, and cane, or walls of stone are used in the banana and citrus groves.

In general, the coastal plain is a very productive area, and its agricultural products contribute greatly to the economy of the country.

Mountain Ranges Are Extensive

Lebanon Range. The Lebanon mountains form the bulk of the land mass of the country, paralleling the Mediterranean coast, and extending inland to the Bekaa valley. They rise to an average elevation of 6,500 feet, with some peaks reaching over 9,000 feet. Two coastal plateaus, the Nebatiye in the south, and the Koura in the north, separate the mountains from the coast in these areas. Except for a few local outpourings of basalt, the Lebanon range is composed dominantly of marine limestone, with minor quantities of sandstone and shale. The limestones have been subjected to intense pressure and folding, and as a result are greatly fissured, faulted and brecciated. Many of the limestones are porous and act as huge sponges which absorb much of the rainfall, releasing it at lower elevations in the form of springs.

The climate of the Lebanon mountains ranges from the semi-tropical type adjacent to the coastal plain to the temperate climate of the higher slopes. Annual rainfall exceeds 60 inches in the higher portions of the mountains, falling largely in the winter months. A considerable proportion of this is in the form of snow. At least 10 permanent streams head up on the western slopes and flow to the sea. The eastern slope of the Lebanon mountains is drier and more precipitous than the western slope.

The dense forests which once covered the mountains of Lebanon have largely disappeared. Today there are only about 175,000 acres which might be termed forest land, most of which is rocky and rather sparsely covered with small pine (Pinus halapensis) and oak (Quercus Coccifera). Only two small groves of the famous Cedars of Lebanon (Cedrus libani) remain in the country. There are no forests of merchantable saw timber. The great population pressure on forests as a source of fuel and the uncontrolled grazing of goats have been the principal factors responsible for this condition. Reforestation is being attempted in some areas, and should prove effective if controlled grazing is enforced.

Soil erosion has been active over the centuries, with the result that large areas of the mountains are almost barren masses of limestone, with little soil or vegetative cover. Shallow to comparatively deep soils are found on

the extensive terraced lands, or on areas where the native vegetation has been retained. In general, the soils of the Lebanon mountains are reddish brown, stony, clay loams (Terra Rossa) grading to yellowish brown, stony clay loams at higher elevations. The soils in the coastal section of the Nabatiye and Koura plateaus are formed from the extensive marls of the area. They are dark brown clays (Rendzinas) on flat topography, with shallow, gray to white loams located on hilly terrain. Erosion has been especially severe in these areas, with the result that large tracts that were formerly cultivated have been abandoned.

The outstanding land use practice in the mountainous section is the utilization of bench terraces. In some areas these extend from the coastal plain almost to the crest of the Lebanon range. Terrace construction is done largely by hand labor, utilizing the existing rock to build retaining walls. It is a slow, laborious, and often costly procedure, but it is the only satisfactory method of utilizing these steep, rocky lands for crop production. In areas where the bedrock is near the surface, soil is frequently brought in from other localities to attain the depth desired. Native shrubs are used to assist in forming terrace walls on areas of marly soils where no large rocks are available. The construction of terraces on very steep slopes results in a series of long, narrow fields which are difficult to cultivate, especially with machinery.

A great variety of crops are grown on the terraced lands. These include grains, vegetables, grapes, olives, figs, and a variety of deciduous fruits. Fruit raising, however, is the dominant type of agriculture. Olives and figs are grown up to 2,300 feet elevation; apricots, plums, and peaches from 1,700 to 3,500 feet; while apples are generally found above 2,300 feet. Extensive plantings of Stark's and Golden Delicious apples have been made in the last few years, principally as an investment by businessmen or absentee landlords. While a dry land type of agriculture is most common on the terraced lands, sizeable areas are irrigated wherever water is available from springs. This is particularly true for apple or vegetable production. It is not unusual to see irrigated, terraced slopes up to 40 per cent, with no appreciable soil losses due to erosion.

In addition to agriculture, grazing, and forestry, the Lebanon mountains are utilized extensively for recreation. The cool summer climate and the fine scenery are especially attractive to tourists from other countries in the Middle East. Many towns located in the Lebanon range depend largely on the tourist trade for their livelihood. The development of ski areas in several localities has made this sport very popular in the winter months.

Anti-Lebanon Range. The Anti-Lebanon mountains are located in the eastern part of the country, with the western slope forming the boundary between Lebanon and Syria. They rise to about the same height as the Lebanon range, and are composed largely of limestone. The climate, however, is considerably drier, averaging from 15 to 30 inches of rainfall a year on the lower slopes which lie in Lebanon. There is little native vegetation other than a few shrubs and scattered trees on this portion of the range. The soils are predominantly reddish brown, shallow, stony clay loams. Large areas are devoid of soil or vegetation. The lands are not utilized extensively for cropping, and relatively few terraced areas are found. Grains, lentils and grapes are grown where soil and topographic conditions are favorable. The scant plant cover affords a limited amount of grazing for goats, a practice which has contributed to the erosion and loss of much of the soil mantle. Fortunately, the fractured and porous condition of much of the limestone does permit the absorption of a good portion of the winter rains, which are released in the form of springs at lower elevations.

Bekaa Valley. This valley is situated between the Lebanon and Anti-Lebanon mountains, and lies at an elevation of 2,500 to 3,000 feet above sea level. It is approximately 80 miles long, and averages about six miles in width. Near Baalbeck the valley is separated by a slow, flat divide into north and south sectors. The North Bekaa is drained by the Orontes River, which flows northward into Syria. The South Bekaa is drained by the Litani River, which flows southward and empties into the Mediterranean Sea near the city of Tyr. Both streams are fed from springs.

The climate of the valley is more of the continental type, and is characterized by long, warm, dry summers, and a relatively short, cold, wet winter season. A considerable variation in annual precipitation occurs between the southern and northern parts of the valley. The South Bekaa has an average annual rainfall of 20 to 25 inches, while the North Bekaa has a semi-desert type of climate, especially in the north, with from eight to 12 inches of rain.

Only scattered areas of native shrubs and grasses are found in the South Bekaa, since it is almost entirely cultivated. The rather extensive, uncultivated sections of the North Bekaa support a variety of drought resistant shrubs and grasses.

The soils of the Bekaa Valley consist of deep alluvial deposits washed from the adjacent mountains. In the South Bekaa they are predominantly uniform, brown, dark brown, reddish brown and red loams and silty clay loams. Small areas of organic soils are found in swampy sectors. Soils in the North Bekaa are largely yellowish red loams, with a pronounced lime accumulation occurring in profiles located at the extreme northern part of the valley. Large tracts of rocky lands are found in the North Bekaa.

The Bekaa Valley is often called the "bread basket of Lebanon," and rightly so, since a large part of the

Figure 3. Mixing beach sand with the clay soils of the coastal plain to facilitate water infiltration and tilth. (South of Sidon.)

grains raised in the country are grown here. Approximately 75 per cent of the valley is dry farmed, with the principal crops being wheat, barley, lentils and vetch. Wheat alone accounts for over one half of all crop land. The land is planted after the first autumn rains, and the crop is harvested in early summer. Crop failures or low yields due to drought are common, especially in the North Bekaa. Double cropping on dry land is practiced to some extent in the South Bekaa, with melons or corn being planted after the wheat harvest. Usually, however, the land is fallow a third to a half of the time.

Irrigation in the South Bekaa is confined largely to lands adjacent to the Litani River or to springs, where direct diversion or pumping is relatively easy. The limited area of irrigated land in the North Bekaa is served principally from the Laboue spring. No large scale irrigation from the Orontes River has been attempted in Lebanon, due to high pump lift required to raise water to the majority of the potentially irrigable lands.

The principal irrigated crops in the Bekaa Valley include potatoes, onions, corn, wheat, vetch and vegetables. Crop rotations tend to vary with existing or anticipated market prices of the produce rather than with soil fertility requirements. Both animal manure and chemical fertilizer are used, with application rates depending to a large extent on the prosperity of the land owner.

Poor drainage is a problem in some parts of the South Bekaa. The gradient of the valley from north to south is small, with surface drainage being inadequate in the flatter sections during the winter and early spring. Sizeable areas in the southern part of the valley are inundated each spring by flooding from the Litani River and its tributaries. Engineering measures to straighten and deepen the channel of the Litani River are necessary to correct the situation. In addition to surface flooding, the water table is near the surface in certain areas, and remains there long enough to interfere with agricultural operations. The lack of water regulation, inadequate canals, and poor irrigation techniques have contributed to this condition. Swamps have developed in some sectors where springs emerge from the mountains. The very low concentration of soluble salts in the soil, and the long growing season, have tended to permit poor drainage conditions in parts of the South Bekaa without the pronounced ill effects to crop growth that might be experienced in other areas having less favorable physical characteristics.

The North Bekaa, with its more limited water resources, does not appear to have any present drainage problems.

Land Ownership Problems Are Great

Several social and economic factors in Lebanon have a profound effect on land use in addition to the physical aspects mentioned. One of the most important is that of land ownership. Problems relating to land ownership vary widely within the country. In general, the farmers of the district comprising a large portion of the Lebanon mountains own their land, which is in small to medium sized farms. Both large and small holdings are found in the balance of the country, with remnants of the feudal system still in evidence in the Akkar district and parts of the Bekaa Valley. Lands in these areas are rented on a crop share basis, with rents of 50 percent or more of the gross crop yield being standard. Tenure is on an annual basis, and can be terminated at any time by the owner. Such a system has little regard for the wise utilization of soil and water resources.

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Water Makes A Difference

W. A. ROCKIE

WHEN WE REACHED the Island of Jamaica in January, the dry season (usually December through April) was well under way. The less humid areas of this island, consisting mostly of the lowlands along and near the southern coast, had already donned their typically brown dry-season coats. It was winter, and weather was delightful.

This year, however, the dry season was even drier than usual. In addition, it also lasted a month later than it normally does, until the last of May this time, and the result was an extremely severe and very damaging drought. During both April and May, the whole island became pretty much of a desert, in spite of the humid tropical forest which clothes most of the area.

The central mountainous upland, where everything is normally green even during the dry season, took on the same parched and shrivelled appearance as the more arid lowlands. Streams dried up, and the many hundreds, yes, thousands, of concrete reservoirs that are necessary to have water through the dry season, became empty. There were very few exceptions. Pastures turned brown, or worse still, were eaten into the ground. Hundreds of trucks were shoved into the breach, hauling water into this seasonal waterless desert. Many hundreds of towns and villages; tens of thousands of farms; hundreds of thousands of people; and all of their livestock and poultry were, for the most part, wholly without water. Also because of the drought, it was also necessary to haul feed into the area, especially for the dairy cows.

Although practically the whole island is covered with trees which are eternally green, even they began to shed their leaves because of the drought. Those on most of the citrus trees curled up into a tight roll, and the plants in too many of the normally fine gardens wilted down flat to the ground. Until the rains finally came two weeks ago, the normally evergreen Island of Jamaica reminded one more and more of the desert and less and less of the humid tropics.

Water Is Rationed

The arrival of a truckload of water in a parched village practically started a riot. People mobbed the water-wagon, each desperately trying to fill his five-gallon tin with a share of the precious liquid. Each time I saw a village being supplied by truck, I was vividly reminded of several waterholes along the south edge of the Sahara Desert where thousands of head of goats, long-horned cattle, sheep, donkeys and camels were always fighting and milling around trying to get their turn at a drink. There was not too much difference. When water gives out, life gets fearful and quite irresponsible. The load was never enough to fill all of the waiting vessels. And thousands of people were not waiting for the truckloads, but were carrying headloads—mostly in five-gallon tins—for many miles from one of the few wells or tanks which still yielded water. Their drinking water, their animals, their potted plants and their typically tiny gardens were all on mighty short rations. All other uses for water were forgotten. They became of no importance. Many of the domestic animals and fowls died of thirst, and many others barely survived. It has been a long time since the island has been as hard hit by drought, I am told.

Even the wet northeast corner of the island, with more than 250 inches of rain per year, was suffering from lack of water. This was unheard of during recent times. Some of the best hotels in this area, filled with tourists from the states, had to operate without water. When this happened, the luxury-loving tourists really howled. Probably I would have hollered just as loud as any, if I had been paying $25 to $35 per day for a room with bath—but without any water.

And then the rains came! In two or three days, the citrus leaves had unrolled, some of the garden plants again raised their heads, grass became green, and plants, animals and people again could enjoy a drink of water. Now, two weeks after the drought left, the desert has come to life. The pastures and lawns look like green velvet and the beautiful royal poinciana is in full bloom. The streams have again begun to flow, and we again have an inviting landscape.

What a difference water makes!

W. A. Rockie, a charter member of the SCSA, wrote this revealing article while on an assignment in Jamaica for the Soil Conservation Service.

Programs of Cost Sharing

(Continued from page 227)

Statistical Summary for the years, 1947-1951, and *Summary* for 1952, United States Department of Agriculture, Production and Marketing Administration and Agricultural Conservation Program Service.

6. *Agricultural Conservation Program Summary 1952,* United States Department of Agriculture, Agricultural Conservation Program Service, November, 1953, pp. 2-5.
7. *Agricultural Conservation Program Conservation Practice Summary 1936-1949,* United States Department of Agriculture, Production and Marketing Administration, May, 1951, p. i.
8. *Agricultural Conservation Program Summary 1952,* United States Department of Agriculture, Agricultural Conservation Program Service, November, 1953, p. 78.
9. *Ibid.*

Book Reviews

OUR NATIONAL FORESTS. By Bernard Frank, *University of Oklahoma Press, Norman, Oklahoma. 238 pages, illustrated. 1955. $4.00.*

Here is a story well told about *your* national forests. The author, a career official of the United States Forest Service, writes authoritatively. By virtue of his long years of service with this bureau in the United States Department of Agriculture, he adds salt and spice to recording of events which formed public opinion, resulting in the creation of national conservation assists of soil, water, mineral, and plant resources, all to be found in our national forests and unequalled by any other nation.

There are 180 million acres in our 148 national forests. About each the author has something to say. He writes at length about a few, choosing them so as to recount their value—their many contributions to social needs, both national and local.

There is much of interest to all on questions of policy relating to use of the mineral, grass, forests, water, game and recreational resources. It is in the presentation of the issues involved that gives greatest worth to this timely publication.

To the reader looking for a Scotchman's vacation, this book is also recommended. Over 40 well-chosen photographs lend enchantment to the narration of travel events of the author and particularly of a few who pioneered as custodians.

It is to be recognized that the average citizen knows little or nothing about *his national forests*. He does not differentiate them from national parks. His assumption of acceptable custodialship by loyal public officials is often tempered by ready partisanship with vociferous minorities selfishly seeking recognition, unmindful or indifferent to the greatest good to the greatest number. It is in recognition of these facts that the author wrote, and in concluding, he looks to the future.

Our national forests have but begun to contribute to a ballooning population. They are a heritage to be jealously guarded. Only an informed public can insure their optimum development so as to meet the material and spiritual needs of their owners.

—Arthur C. McIntyre, *Harrisburg, Pennsylvania*

AMERICA'S NEEDS AND RESOURCES: *A New Survey.* J. F. Dewherst, *editor. Twentieth Century Fund. New York, N. Y., 1955. 1148 pages, 352 tables, 105 figures. $10.00.*

Seldom has an economic study of the size of *America's Needs and Resources* received such widespread notice. This publication by a staff of 25 working over a period of five years is an enlarged version of a similar study released in 1947. The work has enjoyed a front-page review in the *New York Times* Sunday Book Review section and editorial comment in *Life* magazine and numerous other periodicals. The purpose of the new edition is to assess the present status of America's resources, production, and consumption and to project to 1960 trends in these activities.

Highlights from this study make excellent newspaper fillers, such as the following: "America now has the strongest, most productive economic system in human history, capable of attaining by 1960 a total national output of $414 billion and making possible an average family income of more than $6,000 per year, with prospects of still greater growth in the years ahead." Since it is virtually impossible in a short review to give a clear picture of so factual a study as this, and since many of the "highlights" of this work have been reported elsewhere, the following comments apply primarily to the sections on "Land and Water Conservation and Development," "Natural Resources," "Agricultural Capacity," and "Needs vs. Resources."

Immediately upon looking at these chapters one is in doubt about the audience for which they were intended. A work of this size can hardly be expected to interest the general public, but at the same time it hardly goes beyond summarizing materials of other individuals and organizations. For example, the section on land and water conservation simply reorganizes the work done by R. M. Salter, H. H. Bennett, the Paley Commission, and various government agencies. Land and water conservation specialists will surely be familiar with most of these original sources, many of which carry the analysis of problems substantially beyond the treatment given in this large work.

Because of its size and announced purpose, this study invites comparison with the Paley Commission Report, but in such a comparison the Fund study suffers badly —not because it carries its projections to 1960 whereas the Paley Report extends to 1975, but because the Paley Report contained much more analysis of an original nature. Although the Fund study is a disappointment it will probably find a place as a reference work to which the specialist may turn when he wishes to find a summary of material outside his own field.

L. G. Hines, *Hanover, New Hampshire.*

OHIO'S WILDLIFE RESOURCES. OHIO DIVISION OF WILDLIFE, *1500 Dublin Road, Columbus 15, Ohio. 210 pages, including 47 pages of color illustrations, 67 black and white photographs and 87 line drawings, 1954, $1.00 in paper covers and $2.50 in cloth.*

Here is the first comprehensive publication devoted solely to wildlife of the Buckeye State. Ten years in the making, this eye-filling 210-page book was prepared as a reference especially for schools and for persons interested in the state's wildlife resources.

Basically, the book is an appraisal of wildlife and of wildlife management in Ohio. Forty-one species of mammals, birds, and fish are discussed in detail, and the management, research, and administrative activities of the Division of Wildlife are explained so that the reader can ascertain what is being done to perpetuate the state's wildlife resources.

The book consists of twelve chapters and an appendix. The more important and popular species of fish and game are taken up singly and information is given about their status, distribution, and the management techniques that are employed in their interest. The different species of game are grouped according to where they commonly are found—farm lands, forests, and wetlands. The fish are grouped similarly on the basis of streams, lakes and ponds, and Lake Erie. The concluding chapters of the book are on the economic aspects of hunting and fishing and on wildlife administration.

THIS IS DINOSAUR. WALLACE STEGNER, *Editor. A A. Knopf, Inc. New York. 1955. 97 pages. Illustrated. $5.00.*

The proposed Echo Park Dam in Dinosaur National Monument has aroused more heated debate than any other conservation controversy in recent times. Although this book is obviously opposed to the reclamation project within Dinosaur National Monument, it follows an extremely temperate course in relating the story of the history of Echo Park Country, its geological and scenic uniqueness, the wildlife of the area, and the fast waters in its canyon rivers that delight—and sometimes dismay—the foldboat enthusiasts.

It was down the turbulent Green River that Major John Wesley Powell, the explorer of the Green and Colorado Rivers, bulled his way in 1869. The mishaps and adventures of this early expedition can be traced in many of the country's names, such as "Disaster Falls" where the Powell expedition lost one of its boats in the rapids.

This Is Dinosaur tells its story well and the written text is supplemented by an exceptionally fine collection of color and black-and-white photographs. At times, however, the rather heavy burden of editorial restraint under which most of the authors write leads to somewhat dry description in avoidance of controversy. For this reason the last chapter, *"The National Park Idea,"* is especially welcome. It discusses in general terms some of the problems faced by such regions as Dinosaur National Monument and gives meaning to the rest of the book.

—L. G. HINES, *Hanover, New Hampshire.*

CLIMATE ATLAS OF THE UNITED STATES. *By* STEPHEN A. VISHER, *Harvard University Press, Cambridge, Massachusetts. 403 pages. 1954. $9.00..*

The author of this outstanding book has assembled a eral use is concerned. Conservation engineers, however, climatology. The 1,031 maps and diagrams covering temperature, wind, sunshine and precipitation are simple in design and easily understood. Of these maps, Professor Visher prepared more than 400 to complete the cycle of information needed to cover the entire field. The subject matter is well organized and presented in usable form—even for the amateur concerned with the various aspects of climatology.

Obviously, the book has its limits in so far as its general use is concerned. Conservation engineers, however, working with rainfall patterns in relationship to hydrology, will find the discussions and maps covering the field helpful as basic and background information. This also applies to agronomists, biologists, and others working with the natural forces.

MUSKINGUM COUNTRY. *The Story of the Muskingum Conservancy District. The Muskingum Watershed Conservancy District, New Philadelphia, Ohio. 28 pages. 1955.*

No other conservation enterprise has aroused so widespread an interest as the Muskingum Watershed Conservancy District. This is natural since it is the model example of multiple-resource development, not only in this country but in the world. Some handy booklet that would satisfy the demand for information about *"The Miracle of the Muskingum"* has been sorely needed. It is available now with the publication of *Muskingum Country*, a well written and illustrated little volume that tells the essential facts.

The genesis of the Muskingum Plan, the working principles of a Conservancy District and how these were applied to the 8,000 square miles in the heartland of Ohio are related with simple clarity. So, too, is the reason why it was decided to adopt what is known as "headwater" flood control, then somewhat of a pioneering idea. The resulting series of 14 dams, most of them back along the feeder streams that collect and funnel water into the Muskingum River, laid the basis for the multiple-purpose program that evolved. It was the first signal demonstration that a watershed is an entity, in which land, water, forests and recreational resources can be conserved, developed and managed together. How all this has followed is also described.

What has been accomplished, the reader learns, is pri-

marily due to local initiative, planning, organization and management. But the specialized services of many federal and state agencies were also put to use, all working under authority of the Official Plan. One finds here a practical example of the federal, state and local cooperation that is being talked about so much now.

The fisherman and the vacationist are given some pertinent information about the lakes, the accommodations they afford and the fish to be found in them. Only one needful thing seems omitted. This is a merited tribute to the caliber of management the Muskingum Conservancy District has had. But perhaps the facts speak eloquently enough of that.

—E. H. TAYLOR, *Philadelphia, Pennsylvania.*

The Story of FAO. By GOVE HAMBIDGE, *D. Van Nostrand Company, Inc. New York. 303 pages, illustrated. 1955. $6.50.*

The Story of FAO provides an enlightening account of FAO from its beginning—what led up to it and what it has accomplished in its first decade of service to Member-Governments. It is essentially a story of how a century-old American idea—the idea of agricultural extension—is working at the international level.

Gove Hambidge, author of this delightful book, was the first person appointed to the staff of FAO after it was established in October 1945. He was also one of the architects of FAO, having served on the U. S. Delegation to the first United Nations Conference on Food and Agriculture at Hot Springs, Virginia, which laid the groundwork for the organization, and as executive secretary of the Interim Commission that wrote the FAO constitution. Mr. Hambidge is at present the North American regional representative of FAO. Before becoming an international official he edited the U. S. Department of Agriculture's *Yearbook of Agriculture*, starting the series of big monographs in 1936.

Native Land. NATIONAL ASSOCIATION OF MANUFACTURERS, *2 East 48th Street, New York 17, New York, 48 pages, illustrated. 1955, 10 Cents.*

According to the authors, *Native Land*, illustrated by by more than 70 photographs, was prepared in response to requests by educators and industrialists for a presentation of the subject for use both in classrooms and among the public.

A brief description of the role of land use in the history of nations serves as an introduction to this very fine publication. This is followed by easy-to-read information on soil, forests, water, wildlife, and National Parks. Attention is given to natural resources estimates against the background of a population growing at the rate of two and one-half million people a year.

Native Land also outlines career opportunities for young people in the many conservation fields and the special education and vocational requirements of these career areas.

It is expected that many industrial firms with an interest in the renewable natural resources will use *Native Land* as an effective means of bringing the conservation story to the general public.

Facts About Wind Erosion and Dust Storms on the Great Plains. SOIL CONSERVATION SERVICE, *Leaflet No. 394, U. S. Department of Agriculture, Washington 25, D. C. 8 pages, illustrated. 1955. 10 Cents.*

This publication presents considerable background information about droughts during the early settlement of the Great Plains; also the first dust bowl during 1931 and those reoccurring since 1950. Another section of the leaflet discusses how wind erosion starts and spreads.

The authors have also done an excellent job in setting forth a plan of action to control wind erosion and dust storms. The program covers such measures as changes in land use and management of cultivated and range lands. Emergency measures for cultivating fields are also covered in the discussions.

The leaflet is well written and contains many excellent illustrations.

Streams, Lakes and Ponds. By ROBERT E. COKER, *University of North Carolina Press, Chapel Hill, North Carolina. 327 pages, illustrated. 1954. $6.00.*

This book has an appeal to the conservation worker as well as to the man interested in the mysterious world below the surface of stream, lake, or pond. It will undoubtedly help bring agreement as to the proper use of given water areas, and it is not too technically written for the average nature student. Moreover, the publicity recently given to undersea life is an indication of how much interest people can develop in the subject.

Streams, Lakes and Ponds is divided into three sections. The first part deals with water and all its properties, including an interesting discussion of types of productivity shown by different lakes. It may provide clues as to why fishing is not so good in some areas. A description of running water, its living creatures, and pollution problems as well as life to be found in still waters are discussed in the last two sections of the book.

Joint Committee on Grassland Farming—Report for 1955. *Compiled by* HOWARD B. SPRAGUE, *Department of Agronomy, Penn State University, University Park, Pennsylvania. 44 pages, mimeographed. 1955.*

The 1955 Report of the Joint Committee on Grassland Farming contains nine excellent papers including a Report of the Chairman of the Committee presented at Jacksonville, Florida, November 13-14, 1954. This event

preceded the ninth annual meeting of the SCSA which was also held in Jacksonville.

All of the subjects covered in the report feature grassland farming in the South.

Water and Land Resources of the Crab Orchard Lake Basin. BY J. B. STALL AND OTHERS. *State Water Survey Division, Urbana, Illinois. Bulletin No. 42. 53 pages. 1954.*

Crab Orchard Lake, largest man-made lake in Illinois, was completed in 1940 for an industrial water supply and as part of a land-utilization project and for recreational purposes. It is located in Williamson County. The report shows that the lake has a drainage area of 185 square miles and had an original capacity of 23,054 million gallons. In the first 11 years, silting reduced this capacity by 4.8 per cent. Since completion of the lake, the cities of Carbondale, Herrin, Marion and Centerville have found in necessary to construct pipelines to the lake for an emergency water supply. The report shows that the lake can furnish a water supply considerably in excess of that being used at the present time.

A detailed study of land capabilities was made on the basis of the comprehensive soil survey of this watershed. The conservation measures recommended for the watershed are based on the capabilities of the land. The program recommended would increase crop values by nearly 100 per cent. The report points out:

"The total volume of all crops in the watershed area can be increased from the present $11 per acre average to $21 per acre by applying a recommended conservation program based on the capability of the land.

"The report estimates that the total cost of establishing the recommended conservation program would amount to an average of about $38 per acre. On this basis, the program would pay for itself in four years.

"Under the conservation program, cropland acreage could be increased from 39,469 acres to 58,440 acres by cultivating land now idle or in pasture or woods.

"The planting program for the lake basin calls for a number of conservation measures. Approximately 67 per cent of the cropland in the area should be planted on the contour. About seven per cent of the area should be in grassland farming." Approximately 16 per cent of the cropland needs farm drainage of the surface ditch type. The remaining 10 per cent would be terraced. There is also a need for 97 miles of sodded waterways and 179 miles of field diversions.

"The increase of controlled planting and the use of idle lands would reduce erosion and the rate of silting in Crab Orchard Lake. This would increase the lake's water capacity."

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TRUE-TO-LIFE Stories received 1953 publication award from National Association of Conservation Education and Publicity. Recommended by Soil Conservation Society of America, the Boy Scouts of America, National Wildlife Federation, Izaak Walton League of America, Outdoor Writers Assn. of America, American Nature Assn., Wildlife Society, and other national and local education and conservation organizations.

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Field Notes

Watershed Plan for Ohio Is Given Recognition by Trade Association

The Ohio Forestry Association has been given an Award of Merit by the American Trade Association Executives for its public service program in developing "The Ohio Watershed Conservation Plan."

The project stemmed from water shortages since 1953 which have seriously endangered Ohio's economy. A year's research was undertaken by a 70-man committee representing industry, agriculture, communities and government agencies. A 200-page report was prepared, a digest of which is to be published, presenting revelant statistics on the state's 14 watersheds, and offering concrete plans which, in conjunction with sound forestry and soil conservation practices, may become the basis for long-range water conservation projects.

USSR Delegation Studies Conservation During Visit to the United States

Andrei Shevchenko, a Russian agronomist and conservation expert, expressed appreciation upon receiving copies of the JOURNAL OF SOIL AND WATER CONSERVATION during his stay in Iowa as part of the Russian farm-study delegation. Shevchenko stated, through an interpreter, that *"Conservation is a very important matter and we hope to learn more about it while in the United States."*

Several copies of the JOURNAL are regularly sent to Russia on subscriptions paid for by the Russian Academy of Science.

The exchange visit of American farmers and Russian agriculturists was the result of an editorial in the *Des Moines Register* and *Tribune* following press releases that Russia was in need of increasing her agricultural output. Lauren Soth, the author of the editorial, made the trip to Russia. J. S. Russell, prominent in *Society* affairs, met the Russian delegation in New York and traveled with them to Iowa and over most of the state. Dean W. V. Lambert of the University of Nebraska, a member of the SCSA, was leader of the American delegation to Russia. Herb Plambeck, Farm News Editor of Radio Station WHO in Des Moines, also a member of the *Society*, made the trip to Russia as a news reporter.

The Russian delegation was led by Vladimir Matskevich, Deputy Minister of Soviet Agriculture. None of the 12 delegates were "dirt farmers" as we know them in America, but rather were agriculture scientists, farm managers, or in some way connected with agricultural administration in Russia. All expressed an interest in farming methods, equipment, plant breeding, animal feeding

Soil Conservation Society of America

"This may be God's country, but it looks like the devil has been farming it!"

Figure 1. *Left*: These tomatoes grown after Pangola grass presented no difficulty in cultivation. *Right*: Watermelons following a Bahia grass and indigo sod resulted in a more vigorous condition of the vines; also permitted a longer harvesting season and better quality melons.

The Use of Grass Based Rotations . . .

It is said by those in the older grassland farming section of the world *"To obtain the most from grassland, produce crops a portion of the time, and to obtain the most from cropland, produce a grass a portion of the time."* Such a concept is relatively new for most farmers in Florida.

The belief that only new land could produce exceptionally good crops was once accepted without question. This belief resulted in the clearing of land that should have remained in trees or other permanent vegetation and eventually culminated in the heavy cropping of what is today designated as Capability Class I, II and III land.

The continued cultivation of these soils resulted in erosion, loss of organic matter and general unproductiveness to such an extent that annual legumes for green manure were worked into the cropping system whenever possible. These legumes usually produced a response in the succeeding crops but this effect was lost as the clean tilled crops followed. The sandy soils so common in Florida coupled with high temperature and rainfall were particularly susceptible to loss of organic matter.

Only recently has the use of grass in rotation with crops enabled farmers in Florida's Soil Conservation districts to again have "new ground" on what was depleted cropland.

Grass as a Base for Rotations

The establishment of pasture as a conservation measure and as a source of feed for an expanding cattle industry opened an opportunity for conservation farmers to use grass as the base for their rotations. The fibrous nature of grass resists rapid decay better than the more succulent legumes.

Farmers cooperating with the Sumter Soil Conservation District were among the first to use grass based rotations in Florida. Encouraged by the supervisors of the district and aided by Soil Conservation Service Technician E. L. Strickland, watermelon and truck farmers have increased yields and controlled wind erosion by following such a rotation.

Joe Webb of Bushnell produced nine carloads of watermelons on 17 acres, this year, following a 10-year sod of Bahia grass and hairy indigo. A good yield is considered one car to three acres. In addition to this high yield, seven of these nine cars were top grade melons.

J. E. Beach rented 100 acres of Bahia grass and indigo sod from Lofton Brown to produce watermelons. Beach stated that he had been growing melons all his life and this was the best field he had ever produced. W. L. Beach, who is associated with his father in the production of watermelons, pointed out that the vigorous condition of the vines permitted a longer harvest season and better quality melons.

Bob McElyea, in addition to the production of watermelons on sod land, also produced tomatoes, cucumbers

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and educational methods. They took copious notes, especially at Iowa State College where they heard discussions on experiments and methods of dispensing agricultural information.

On several occasions they expressed amazement about production and, strangely, the one question they continually asked of Iowa farmers was *"How much profit did you make?"* They asked this question about swine, corn and many other livestock and cropping practices. And they also asked the same question of several local business firms.

and peppers. The tomatoes were grown after Pangola grass, the other crops followed Bahia. McElyea was well pleased with the tomato production and stated that the Pangola grass presented no difficulty in cultivation of the crop. The lack of viable seed on the Pangola eliminated the volunteering of seedlings and the grass reestablished itself from the few plants left in the tomato rows. In addition, there appeared to be a minimum infestation of nematodes, which is a major problem in the production of tomatoes on the light soils in this section of the state.

The appeal to cattlemen rests in the fact that one crop on grassland does not kill the grass and the residual effect of the fertilizer stimulates subsequent growth. Strickland reports that watermelon growers are attemping to obtain sod land for their 1955 production. The results of the last two years have been impressive enough to encourage both the growers and the cattlemen.

Irrigation Increases Tobacco Production

Paul Hillhouse, in the Hamilton Soil Conservation District, decided to take advantage of his irrigation system, located adjacent to a four year old Pensacola Bahia sod, for the production of bright tobacco. He produced 2,200 pounds of tobacco per acre on this 5-acre planting following the sod. In this county the average yield is 1,200 pounds per acre. Paul Webber, SCS technician in this district, reported that Hillhouse was so pleased with the above results obtained on the '53 crop that an additional 5-acre block of sod was used for tobacco and handled in the same manner in '54. Hillhouse, to assure rapid recovery of the sod following his '53 crop of tobacco, reseeded the area to Bahia. This area was again ready for grazing in the Spring of '54.

John Lambe, supervisor in the Chipola River SCD and president of the Florida Association of District Supervisors, planted 17 acres of peanuts following a four-year sod of Bahia grass in the Spring of '53. Yields on this field were double those obtained in other fields on the farm. Lambe produced 35,000 pounds of nuts on this area. S. L. Morrow, Work Unit conservationist assigned to this district, pointed out that not only was the yield double that in other fields, but that the quality of the nuts was superior. Lambe also stated that the gross return on this field amounted to $80 more than the average for other fields. This field was reseeded to Pensacola Bahia in the Spring of '54 to make certain of rapid recovery of the sod. An additional field was broken in the Spring of '54 to be handled for peanut production in the same way as the previous year.

Sarge Gainer in the Orange Hill SCD broke a five-year 6-acre sod of Pensacola Bahia and Crimson clover in the Spring of '53 for corn production. He obtained a yield of 65 bushels per acre. This is an area with average yields only slightly above 15 bushels per acre. U. S. Harrison, SCS technician assigned to this district, pointed out that only a 75 per cent stand of corn was secured on this area. He stated Gainer realized that fall breaking growing a winter legume to add additional nitrogen and rebreaking in the spring would facilitate soil preparation and insure better stands.

W. C. Walker in the Yellow River SCD decided to give a grass based rotation a good test on his farm. He planted two adjoining 20-acre fields of the same soil type to Texas seeded ribbon cane for silage. One field followed a four-year sod of Bahia sod and clover; the other was old cropland that had only an annual legume in rotation with general farm crops. Yields following the sod were 16 tons per acre; those in the adjoining field nine tons. Walker, reporting these yields to R. L. O'Barr, SCS technician in this district, said, "As we harvested the silage we filled the trailers on one row in the field following sod; it required almost two rows on the other field.

Instances where grass based rotations are being used extend from the extreme western part of Florida down through the Peninsula. Supervisors of Soil Conservation districts and SCS technicians feel that this relatively new concept will eventually become a standard conservation practice. Conservation farmers can look forward to again having "new ground" on what were once depleted and eroded areas.

—H. E. VAN ARSDALL, *Lake City, Florida.*

Volunteering of Hairy Indigo On Bare Soil and in Mass Sods

In 1946 a crop of ordinary Hairy Indigo was grown on a piece of land at the Soil Conservation Service Nursery at Brooksville, Florida. The seed were combined from this crop and the only seed which went into the ground were those that shattered before being harvested or that went through the combine at harvesting time. In either case, it is not considered to have been a large amount.

In 1947 a volunteer stand of the Indigo came up early in the season. The area was plowed in July and seeded to a seed production crop of Lanceleaf Crotolaria. The planting was in rows. A second stand of Hairy Indigo came up and eventually crowded out the Crotolaria. The Indigo growth was more vigorous than that of the Crotolaria. This stand was mowed and the area plowed in October so that not a seed of the Indigo matured.

Each year since then a new crop of Hairy Indigo has volunteered and each year the stand has been mowed and plowed under in order to destroy the plants before there was a chance for seed to mature.

In 1953, the seventh year, the stand was thought not to be so heavy as in the past but it was sufficient to give an excellent cover on the area.

After the experience of 1947 when Hairy Indigo seedlings volunteered and dominated the land we set out to

other crops of pure seed are to be grown presents a serious weed problem, and secondly, we wanted to find out how often it would be necessary for a farmer to plant the seed once his land had a fair crop of the seed in the soil. The first problem is of interest to pure seed growers or to those persons who raise crops on clean cultivated fields which must remain in clean cultivation. The second is important to those who want volunteering of summer leguminous cover crops and where an early cold spell may destroy the current year's seed crop before the seed matures, thus preventing volunteering the following year.

We had hoped to carry this trial on for as long as seed determine the number of years a piece of land would be tied up after producing a crop of Hairy Indigo seed. We were interested in this for two reasons: volunteering of heavy stands of Hairy Indigo on nursery land where volunteered but due to the fact that this nursery is to be abandoned before another year's crop can be studied, the test stops here, in the seventh year. We feel however, that volunteering from seed which originally fell to the ground in 1946 could be expected for two to three or more years.

We have also found that volunteering of Hairy Indigo is better following plowing than any other treatment. Disking may be satisfactory for one or two years but, with us, stands seem to get weaker if plowing is not done by the third year. Plowing each year followed by disking is best.

As stated above the original planting for seed production of Hairy Indigo was made at the Brookville Nursery in 1945. The area on which this crop was grown was allowed to lie idle the summer of 1946 and 1947. Common Bermuda came into the land and since the land was untilled no Hairy Indigo was in evidence during 1947 except in small spots. In August of 1947 the area was plowed, disked and prepared for the seeding of Argentine Bahia for seed production. The Bermuda grass covered the ground by spring 1948 with still no Hairy Indigo coming up. However, the Bahia did come in the summer of 1949 and since then has made a full stand of sod. Hairy Indigo seed is in this land but it never comes up in the sod except where there is a bare spot. In maintaining this sod for good seed production of Argentine Bahia we have used various means of severely disturbing the sod, in fact, we have found that better yields are obtained by partially destroying the stand. We use heavy equipment, even turning plows, for this purpose. After such treatment we invariably get good germination of the Hairy Indigo in the area.

In the summer of 1953 a strip of the sod 20 feet wide running across the full width of the Bahia sod was turned and heavily disked. A complete stand of the Hairy Indigo came up on the plowed strip. The only other Hairy Indigo in the field was on isolated thin spots.

Our Bahia field, as has been pointed out, is used for seed production and conditions are not simliar to those found in a heavily grazed pasture of the same grass. We feel, however, that a properly managed pasture would need special treatment to get a good and satisfactory stand of Hairy Indigo.

In summarizing; once a crop of Hairy Indigo seed is incorporated in the soil, enough seed for a successful stand will remain viable for at least seven years or longer. The soil surface must be properly scarified to obtain good volunteering stands whether in cultivated soils or in sodded areas.

—C. B. BLICKENSDERFER, *Sarasota, Florida.*

Sprinkler Irrigation with High Salt Content Waters

There are many areas that have irrigation waters of high salt content. These areas pose special problems in irrigation practices and especially when using sprinkler irrigation.

It is common practice, when irrigating with sprinklers, to irrigate to the bottom of the root zone of the plant each irrigation. However, when using a high salt content water, this practice must change because each irrigation fills the soil to the bottom of the root zone, the plant uses the water and leaves the salt. This is repeated several times each season, which results in an accumulation of salt in the soil. When carried on for several years the soil becomes very toxic and has a very detrimental effect on the plants and especially on citrus trees. The result is less and smaller fruit, or product, and a gradual die-back of the feeder roots and then the death of the plant. This generally shows up first in a yellowing of the leaves.

In order to successfully irrigate by sprinklers, using a high salt content water, it is absolutely necessary to leach the soil once a year in order to wash the past year's accumulation of salts down below the bottom of the root zone of the plant.

The leaching, of course, can be done at any time of the year when it does not interfere with other farming operations. However, it is generally done early in the spring when the weather is still cool and the plant water use is low so that there is time to leave the sprinklers set in each location long enough to carry the salts well below the root zone.

The length of time required to do this leaching will vary from one and one-half times to two and one-half times the normal set depending on soil type and rate of application. The main object is to remove the accumulated salts. This must be thoroughly checked, after the first set, to determine the depth of water penetration. In light sandy soils this check should be made 24 hours after the water is shut off and in heavy soils 36 to 48 hours after. This is

the length of time usually required for the water to reach its ultimate depth. It is, of course, necessary to first determine the depth of the plant roots so as to determine the depth of water application necessary to carry the salts well below the root zone.

After this one deep irrigation each successive irrigation during the year should be normal or to the bottom of the root zone of the plant.

It is also very necessary to control the rate of water application, especially in heavier soils where the tendency is to seal the soil causing puddling and runoff, thereby defeating the purpose of the leaching irrigation. The water, of course, will run off rather than penetrate into the soil.

These high salt content waters will be found in various areas, both large and small, throughout the world. Also many different crops will be found in these areas, according to geographic location. So it is not a concern for certain areas or certain crops, but is of general concern.

One point to be remembered is that any leaching of the soil will leach out favorable salts and fertilizers as well as the harmful salts. It will, therefore, be necessary to add additional fertilizers, especially nitrates, after the yearly leaching.

—ALFRED S. GRAY, *National Rain Bird Sales and Engineering Corporation, Azusa, California.*

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Land Use in Lebanon

(*Continued from page* 248)

A land problem of long standing is the excessive division and dispersal of plots. Upon the death of the head of the family, his land is divided equally among his sons. The result, in many cases, is extreme fragmentation of holdings. However, progress is being made toward combining and rearranging land ownerships.

The desirability of increasing the food production in Lebanon is undoubted in view of the present insufficiency of food grains and livestock products, as well as the steadily increasing population. Population pressure has forced the use of marginal lands to the point where uncultivated areas can be put under the plow only with great difficulty. Any increase in cultivated land would necessarily be made by terracing. A practical and realistic appraisal of Lebanon's land resources forces the conclusion that there should be but little net increase in the cultivated area of the country. As a matter of fact, sound land use principles would indicate the advisability of retiring a considerable area of presently cropped land to forest or permanent pasture.

The balance between population and agricultural production can be greatly benefited by increasing crop yields through the use of better seed, proper fertilization, soil conservation practices, modern farming techniques, and through irrigation and drainage projects. It is probable that the irrigated area of the country could be doubled by a more efficient utilization of the water resources available. Plans have been developed for an irrigation and power project on the Litani River which would alone add about 50,000 acres of irrigated land. Drainage projects, while considerably smaller in extent, would materially increase crop production in some areas. Agricultural research and extension programs, improvement in land tenure, and better farm credit would greatly assist in accomplishing these objectives. In fact, great strides are being made along these lines through a cooperative program between the Lebanese Government and the United States Foreign Operations Administration in the fields of water resources development and agriculture. Present accomplishments and future plans make it appear likely that Lebanon is well on the way toward regaining its Biblical title of the "Land of Milk and Honey."

News Notes

President's Column

During the past six months, this column has talked to quite a few experienced technicians who assist farmers prepare basic soil conservation plans for their farms, at the request of District Governing Bodies, in Ohio, Wisconsin, Illinois, Iowa, Indiana Minnesota and Kentucky. One question asked was whether new owners of farms are willing to accept the basic plan prepared by the former owner. Technicians agreed that if a farm planner or a district supervisor contacts the new owner soon after the new owner or operator takes possession there is little difficulty in getting the plan for that farm accepted. Sometimes small adjustments are required. On the other hand, if contact with the new owner is delayed until he puts in a crop, it is nearly as hard to get the new owner to accept the conservation plan as it was to get the plan accepted by the former owner.

The average number of basic plans prepared in some districts is offset by the numbers of farm plans that go out of existence due largely to a change in ownership. In Iowa, for example, farms change hands about once every 24 years.[1] One district visited in that state recently had 900 basic plans. If the farms change ownership there in accordance with the state average, about 38 farms with basic plans change hands each year. This figure represents a large part of a year's work for a farm planner. If all it takes to keep the plans active on most farms is a visit soon after the farm changes hands, a system that will keep districts informed as to when planned farms change ownership should be put into effect.

A system that will work in one district may not work at all in another district. Several ways to do the job were suggested. In a southeastern Ohio district, all recorded changes in farm ownership are published in the local paper. By spending a relatively short time each week the girl in the district office could obtain the needed information from the paper.

In a district in northern Illinois, the newspaper could not be used for this purpose because the district is close to Chicago and the daily papers are full of sales of numerous small farms—five, 10 and 21 acres. In this Illinois district the suggestion was that the Assistant District Supervisors might obtain the needed information. In some districts there are many Assistant Supervisors.

In Kentucky, perhaps the best bet would be through ASC offices where pretty accurate records of farm ownership are kept because of tobacco allotment.

There are probably many other ways to get the information about changes in the ownership of farms that have been planned for soil and water conservation. The important thing is to adopt a system that will work, and then use it. It is unwise to neglect this phase of the conservation job if the solution is an early visit to a new owner or operator.

Many planners say an early contact with a farm tenant who has recently moved to a farm that is planned is just as important as seeing a new owner.

A. L. PATRICK, *President*.

[1]Figures taken from Agricultural Research Service of U. S. Department of Agriculture "Current Developments in the Farm Real Estate Market" released May 31, 1955.

South Carolina Charter Presented by Bailey

The charter was presented to the South Carolina Chapter of the *Soil Conservation Society of America* at a meeting at Lee State Park near Bishopville on Saturday, June 11. The presentation was made by R. Y. Bailey, Auburn, Alabama. It was received by P. H. Montgomery, Columbia, South Carolina. Mr. Bailey is past president of the *Soil Conservation Society of America*. Mr. Montgomery is chairman of the South Carolina Chapter of the *Society*.

The meeting was opened with prayer by R. W. Bridge, SCS technician, St. George. Mr. Bailey was introduced by W. A. Mason of Newberry.

Ed B. Baskin, Bishopville, president of the South Carolina Association of Soil Conservation District Supervisors, was principal speaker. Among many other interesting comments he said, "Soil Conservation is a problem that confronts every man, woman, and child in these United States. Farmers have a temporary lifetime stewardship of the land they own. Conservation of soil and water is not just a way of thinking, it is a way of life."

Then to illustrate the seriousness of erosion he said, "At flood stage the Colorado River carries 35 million tons of soil into the sea each day."

Mr. Baskin suggested that the Chapter develop a 'Standard of Performance or Creed" for professional conservationists.

The speaker was introduced by T. R. Little, area conservationist, Soil Conservation Service, Bishopville.

Mr. Montgomery presided at the morning session and M. B. Brissie of Rock Hill presided at the afternoon meeting. Be-

(*Continued on page 262*)

"Story of Land" In Demand; Widely Used by Soil Conservation Districts

Over 260,000 copies of the *Society's* new booklet, "The Story of Land," have now been distributed. The booklet was introduced in May of this year and in the first two months was distributed at the rate of 100,000 a month.

Chapter officers and *Society* members planning to use the publication in the near future should keep in contact with the national office so an adequate supply of the booklet may be on hand when the orders arrive. Chapters receive a small commission on sales and any member using copies should designate if he desires the local chapter to benefit.

Sales of 1,000 or more booklets made since the list was printed in the July JOURNAL are as follows:

Jackson Co. SCD, Altus, Okla.	1,000
State Committee, Athens, Ga.	1,000
Taylor Warehouse Co., Elba, Ala.	1,000
Lincoln Co. SCD, Canton, S. Dak.	1,000
South Brown SCD, Aberdeen, S. Dak.	1,000
Farmers Supply Co., Independence, Iowa	1,000
West Ottawa SCD, Grand Haven, Mich.	2,000
Rock Hill National Bank, Rock Hill, S. Car.	2,000
Carolina Power & Light Co., Raleigh, N. Car.	5,000
Steuben Co. SCD., Hornell, N. Y.	1,000
Quality Hatchery & Feed Store, Springdale, Ark.	1,000
Montcalm SCD, Stanton, Mich.	5,000
Potomac Valley SCD, Romney, W. Va.	1,000
Carolina Milling Co., Laurens, S. Car.	1,000
Tuscola SCD, Caro, Mich.	1,000
Cuming SCD, West Point, Nebr.	1,000
Soil Cons. Dist. of Harrison Co., Bethany, Mo.	3,000
East Carroll-Madison SCD, Tallulah, La.	1,000
S. H. Christopher, SCS, Dalton, Ga.—Limestone Valley, SCD	1,000
Russell Co. SCD, Russell, Kan.	1,000
Santa Fe SCD, Lake City, Fla.	1,000
Clayton Co. SCD, Elkader, Iowa	5,000
Spartanburg SCD, Spartansburg, S. Car.	3,000
Greene Co. SCD, Carrolltown, Ill.	1,000
Soil Cons. Service, Mansfield, Ohio	1,000
Presque Isle SCD, Rogers City, Mich.	1,000
Dane Co. SCD, Madison, Wisc.	1,000
Middlesex SCD, S. Lincoln, Mass.	1,000
S. Lincoln, Mass.	1,000
Lee Co. SCD, Bishopville, S. Car.	1,000
Greer Co. SCD, Mangum, Okla.	1,000
Suburban Propane Gas Corp., Whippany, N. J.	3,000
Fort Scott Truck & Tractor Co., Fort Scott, Kan.	2,500
W. D. Franklin, Clinton, Ky.	1,000
Davison Co. SCD, Mitchell, S. Dak.	3,300
Floyd C. Price and Sons, Selma, N. Car.	1,000
Caroline SCD, Denton, Md.	1,000
Catoctin SCD, Frederick, Md.	1,000
Prince Georges SCD, Upper Marlboro, Md.	10,000
Garrett SCD, Oakland, Md.	1,000
Montgomery SCD, Rockville, Md.	1,000
Harford SCD, Bel Air, Md.	1,000
Carroll SCD, Westminster, Md.	1,000
St. Mary's SCD, Leonardtown, Md.	1,000
Lawrence Co. SCD, Lawrenceville, Ill.	1,500
Canadian River SCD, Tucumcari, N. Mex.	1,000
Sauk Co. SCD, Baraboo, Wisc.	2,000
Iroquois Co. SCD, Watseka, Ill.	6,000
J. I. Case Co., Racine, Wisc.	6,000
Wisconsin Public Service Corp., Milwaukee, Wisc.	2,000

Annnal Meeting Planned At Iowa State College

The Iowa Chapter is planning its first two day annual meeting for October 14 and 15 on the campus of Iowa State College. A full program of discussions will be held

Wayne King Farm Scene of Northern Illinois Meeting

Lowell Varland, tenant on the Wayne King farm at Ottawa, Illinois, was host to Northern Illinois Chapter members and their families on Saturday, June 18. Nearly 100 were in attendance for a picnic lunch.

Rev. Milton Heitzman of the National Council of Churches, Chicago, was the speaker of the afternoon. R. G. Downes, Deputy Chairman, Soil Conservation Authority, Victoria, Australia, and his family were also in attendance. Mr. Downes spoke of his observations of conservation in America made during the nine months he had been in the country.

The next meeting of the chapter will be held at Green Lake, Wisconsin, during the 10th Annual Meeting of the parent *Society*. Several committees of the chapter are at work on membership, programs, activities and distribution of the *Society's* publications.

Chapter Meets in Maine For the First Time

The Northern New England Chapter meeting was held at the Christmas Tree Inn, Bridgton, Maine, on June 24 and 25. The group registered just before lunch on Friday and attended a forestry program and tour under the direction of Bob Dineen during the early afternoon. A committee planned for recreation of games, fishing, boating, swimming, golf and horseshoes for late afternoon.

During the evening session, Howard Forsythe acted as chairman and Russ Albright as toastmaster. Song leader was Jim Chadburne. Win Prout of the Cumberland Soil Conservation District gave a few words of welcome and Harry Trask, County Agent, added remarks. Steve Powell showed Maine Wildlife movies while Ken Warren operated the machine. USDA Service Awards were presented by Bart Oliver.

On Saturday morning Howard Forsythe presided at the business meeting and later the group toured the farm of Jim Chadburne.

Dr. R. G. Gustavson Speaks To Washington Chapter

Speaker at the final spring meeting of the Washington Chapter on May 10 was Dr. R. G. Gustavson, president and executive director of Resources for the Future, Inc. Dr. Gustavson told the group of resource areas into which Resources for the Future, backed by Ford Foundation funds, is making critical investigations.

Educators from seven school systems in the Washington area were exposed to a display of conservation education materials on May 11. This was an activity of the education committee which also provided these school systems with a speakers list from chapter membership.

Suspending meetings (but not activities) through the summer, the Washington Chapter will resume monthly sessions in September, says Tom Ayres, chapter chairman.

West Tennessee Chapter Gets Underway With Program

Newest Chapter in the *Society*, the West Tennessee Chapter, held a meeting at Whiteville Lake near Bolivar, Tennessee, on June 18.

First on the program was a tour of the watershed above Whiteville Lake. This was followed by a panel discussion: "Practical Means of Solving the Erosion Problem in This Watershed." D. F. Luckey of the Soil Conservation Service was chairman of the panel. Other members included Eugene Cobb, Tennessee Fish and Game Commission; C. E. Burger, Forester, Soil Conservation Service; William Shelby, Soil Conservation Service; Roy McPeake, member of State Committee on Small Watersheds.

"Management of Fish in Farm Ponds and Lakes and the Economic Possibilities of Fish Farming in West Tennessee" was discussed by Dr. Glenn Gentry, Chief Biologist, Tennessee Fish and Game Commission.

Presentation of the new charter to the chapter officials was made by W. C. Lassetter, vice president and editor of *Progressive Farmer*.

South Alabama Chapter Meeting Attended by 250

Probably the largest chapter meeting of the year was held at Vanity Fair Community House, Monroeville, Alabama, on June 8.

Reporting on the meeting in his daily column "The Passing Throng," Stuart X. Stephenson of the *Montgomery Advertiser* had the following to say:

"The good wives of the professional soil conservation members see to it that their men folk are well fed when they attend meetings at the Vanity Fair Park here. The ladies took a graceful bow when introduced by Vice President T. G. Amson at the *Soil Conservation Society* meeting and later they introduced the large gathering to just about all the fine things to eat one could imagine.

"Every person attending the conservation session expressed some admiration over the beautiful setting—the comfortable building, the grounds, trees and water.

Key Figures Sidetracked

"Three of the key figures scheduled to appear on the Soil Conservation program were sidetracked. President Malcolm Croft underwent stomach surgery in a Mobile hospital, Administrator Don Williams, Washington, Soil Conservation Service, USDA, was detained in Washington because of a special committee hearing on important legislation affecting his department and A. D. Holmes, of Sallion, was unable to attend. Auburn's O. C. Medlock carried the ball for his colleagues, however, and he went all the way.

"State Conservationist Medlock left the profound impression that everyone has a stake in soil conservation.

Pine Trees Paying Off

"Speaker Medlock recalled that in the early days of soil conservation the idea was to control erosion by planting winter legumes and terracing. Progress is revealed in the re-terracing system of today. The old days of planting kudzu and pine trees have paid off. "Today farmers are reaping the benefits of the pine tree planting by the CCC boys during the depression," said Mr. Medlock. He asserted that some of this timber is worth $100 per acre when cleared for pulpwood.

"The terrible fire losses of two decades ago stymied tree planting, but the effective fire control organizations have given a tremendous impetus to the program of planting pine trees throughout the state, Medlock explained."

William Penn Chapter Travels to Meeting by Bus

Some 30 members and guests of the William Penn Chapter travelled from the Philadelphia area for a fine program at Princeton, New Jersey, on Saturday, May 21.

Starting at 11:30 a.m. the motorcade of conservationists toured the Princeton University campus and the Institute for Advanced Study. Food and service were both excellent at the Princeton Inn where the group stopped for luncheon.

The feature of the day was an illustrated talk at the University's Soil Mechanics Laboratory by its director, Professor Gregory Tschebotarioff. He described the tests made on soil to determine its properties for engineering purposes. His slides showed the equipment used to take the disturbed and undisturbed samples required for the tests. In some cases, he pointed out, soil may be used as a structural material. Other times it will be the foundation for structures.

The soil mechanic tests the soil samples to learn what the behavior will be under the expected use. The engineer using the test results may then design his structure within safe limits. Some of the slides illustrated structural failures where knowledge was limited and where insufficient soil testing was done.

A tour of the Soil Mechanics Laboratories followed the lecture. After this many of the group visited the Soil Physics Laboratory which is under the direction of Dr. Winterkorn. An information discussion was led by Dr. Winterkorn on some of the research going on in his department on admixtures for soil sealing and soil-cement.

North Carolina Chapter Reaches Membership Goal

In a letter to all chapter membership chairmen on June 9, Harold Rhodes, chairman of the national membership committee, announced the North Carolina Chapter was the first to reach the membership goal established for it by the committee. The chapter had a goal of 80 new members and on June 1, 1955, 82 new members had been recorded.

Annual meeting for the chapter has been announced for November 11 and 12 at the Vance Hotel in Statesville. Dr. Hugh H. Bennett, founder of the *Society* and past president, will be the speaker. H. Wayne Pritchard, executive secretary of the *Society*, will also attend the meeting to discuss *Society* affairs.

Inland Empire Chapter Member Honored

Plant Material Specialist John L. Schwendiman, member of the Inland Empire Chapter, received the Junior Chamber of Commerce-Sears Foundation 1954 Achievement in Agriculture award for the state of Washington for his contributions in developing new grasses and legumes for conservation use in the Northwest. For the past 10 years he has been agronomist and manager of the USDA SCS nursery at Pullman, Washington where, in cooperation with State Experiment Stations, 18 improved strains were released. These include Whitmar beardless wheatgrass, Manchar smooth brome, Sherman big bluegrass, Volga wildrye, Hard fescue, Topar pubescent wheatgrass and other new grasses which are now being widely used in conservation seedings.

Baseball Goes to Kansas
Kansans Go to Baseball

The Pony Express Chapter chartered a bus on May 29 to attend a ball game in Kansas City between the Cleveland Indians and the Kansas City Athletics.

A picnic followed the ball game and was held at the Wyandotte County Lake.

Chairman Orville W. Love presided at the business session where plans were made to nominate a member for the award of fellow, to promote the *Society's* new booklet, and to invite all county agricultural agents to the next meeting. The September meeting will have a panel discussion on the need for a more effective education program in soil and water conservation.

Excursion–Backwater–New Regime–Release Valve–Debris

The above titles appear on the monthly newsletter of the San Francisco Bay Chapter.

The letter announced the chapter meeting for May 18 and 19 plus several other items. The meeting started at 6:30 p.m. at Mills Patio in Santa Rosa with an Infiltration Hour (?) followed by a dinner and chapter meeting. New officers elected included E. A. Colman, chairman; Fred W. Herbert, vice chairman; William T. Hartman, secretary. Members of the advisory council are: Clark Gleason, Leonard Wobletz, R. Earl Storie, T. R. Littlefield, Russell W. Beeson.

The meeting on May 19 consisted of a tour and started with an observation of the soil-vegetation mapping project of the California Division of Forestry, University of California and California Range Experiment Station. Later the group observed conservation plans, cover conversion, farm drainage, treatment of vineyards, check dams and a new water storage dam in the Sotoyome Soil Conservation District. Before the day ended the group visited the Santa Rosa and Gold Ridge and Sonoma Valley Soil Conservation Districts as well as the Central Sonoma Small Watershed Project.

H. H. Bennett Chapter Meets

Newly elected chairman of the H. H. Bennett Chapter, James C. Ross, right, receives the chapter charter from former Chairman E. V. Huffman. The charter was issued during the presidency of Dr. Bennett and was signed by him. The Kentucky chapter named for the founder of the *Society* is proud of the charter which lists the chapter name and also signed by Dr. Bennett.

"Down the River" In West Virginia

At a recent meeting of the West Virginia Chapter Executive Council it was reported by Jack L. Barrick that 16 counties had completed their distribution of the *Society's* booklet "Down the River" with a total circulation of 50,600 copies. Most of the booklets have been distributed since January 1, 1955.

The chapter's annual meeting is scheduled for September 23, 24, 25 at Jackson's Mill. Subjects for discussion include: Progress of Small Watershed Programs in West Virginia by Al Millender; Fertilizer and Limestone in West Virginia, George Toben; Trace Elements by Dr. Charles Kline of Climax Molybdenum Co.; Woodland and Watershed Management by Sidney Weitzman; Farm and Home Management by K. P. Brundage; Supplemental Irrigation in the East, Tyler H. Quackenbush; Conservation Commission's Plan for Water Development, Carl J. Johnson.

In addition to the above, the group will tour the Salem Watershed, honor their conservationist of the year, recognize the rural pastor.

Firman Bear will be the banquet speaker.

Manhattan Chapter Keeps Members Informed

Chairman Don Atkins of the Manhattan Chapter in Kansas has mailed a letter to all chapter members calling their attention to the annual meeting in Wisconsin and to their chapter meetings planned for the summer. Atkins also stressed the need for new members and encouraged chapter members to assist in all phases of the chapter program.

Lincoln Chapter Tours Watershed

The meeting was brought to a formal opening by the president, F. L. Duley, at the conclusion of a watershed tour. The formal meeting was held in the newly seeded spillway of the floodwater retarding dam on the Lesoing farm. There were 40 members and guests present.

Two new members were introduced. Nebraska area conservationists who were guests were introduced.

There was a discussion by Conservation Engineer Lewis Kehne of the watershed treatment on this Lesoing-Buhrman Watershed. Material on this watershed, its treatment, both vegetative and mechanical, were passed out by Mr. Kehne. Previously Mr. Kehne had discussed the program on the Linn Subwatershed.

A description of watershed work in the entire Salt-Wahoo Watershed was given by Lee Smedly, State Watershed Engineer. This was enlarged upon by H. G. Bobst, State Conservationist, who described watershed treatment progress state-wide.

Announcements were made including the invitation of the Kearney Chapter to attend their annual picnic which will be held on July 10, at the Harlan Dam.

Lunch was served by Dick Weigand and Roy Hoyer.

Maryland Chapters Combine

The Old Line Chapter meeting of the *Soil Conservation Society* was called to order in the Student Union Building, College Park, Maryland, at 8 p.m. by Hugh Hancock, chairman. Mr. Hancock stated the purpose of the meeting was to reorganize and combine the two chapters—Patuxent and Piedmont—into the Old Line Chapter.

John Barnard presented the recommendations on reorganization and it was moved and seconded that they be accepted. Mr. Barnard acted as election chairman and the following officers were elected: Chairman, Hugh Hancock; Vice Chairman, Marshall T. Augustine; Secretary and Treasurer, Paul Galbreath. Mr. Hancock accepted the new post.

Mr. Hancock mentioned that the next stated meeting will be held at Ocean City, Maryland, on September 9, 10 and 11. He stated five or six new members have been obtained. He read a list of committee members.

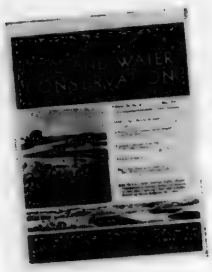
Harry Dengler gave a short talk on the Boy Scout project, relative to a good turn or deed in conservation by Cub Scouts, their camping trips, camp fire sessions and Soil Conservation fair; the districts could invite the Boy Scouts in and show them around.

Austin L. Patrick, President SCSA, gave a talk on "What *Soil Conservation Society* Is and What Is Being Done."

Arthur M. Smith gave a talk on "Fertilizer as an Aid to Soil Conservation."

Movie entitled "Return to Eden" was shown.

CONSERVATION MATERIAL FROM YOUR SOCIETY



Journal of Soil and Water Conservation

Official publication of the Soil Conservation Society of America. Published bi-monthly. Secured through membership, $5.00. Back issues $3.00 per volume.

Reprints as follows:

No. Pages	First 100 Copies	Additional 100 Copies
2	13.00	1.17
4	18.20	1.69
8	35.80	2.93
12	46.80	5.20
16	55.90	6.24

"Down the River"

Over 400,000 copies of this booklet, which colorfully explains and illustrates the need for conservation practices, have been distributed. Business firms, industries, soil conservation districts and many others use the back page for their advertising message.

Price: 10c per copy, $9.00 per 100; $85.00 per 1,000. F.O.B. Des Moines.

"The Story of Land"

The conservation booklet for young and old. In 4 colors, it depicts "The Story of Land—Its Use and Misuse Through the Centuries." Excellent for schools, soil conservation districts, business firms, etc. Back page may carry the sponsor's message. First released in May of 1955.

Single copy 20c, 100 copies $7.50, 1,000 copies $45.00, 10,000 copies $400.00.

Glossary

Published in 1952 after five years of work and study by a special committee. All workers in soil and water conservation and related fields will find it helpful. College and high school agricultural departments use extensively. Thirty-seven pages 8½ x 11, paper bound, 900 terms.

Price: $1.00 per copy.

Mats of Cartoons by Felix Summers

Recent cartoons in Journal of Soil and Water Conservation entitled "Soil Conversation" are available in mat form for local newspapers. They are two columns wide. Three cartoons are ready.

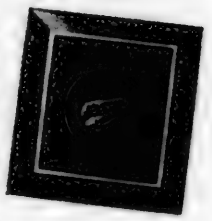
Price: $1.00 for first mat, 50c for each additional in same order. Very reasonable for soil conservation districts.

Emblem

The emblem of the Society shows the hand, representing man, protecting the earth which in turn is nourishing plant life with the sun and rain adding their contribution to complete the cycle well known to all conservationists.

Emblem is available to members and chapters in plaques, rings, lapel buttons, tie clasps. Ideal gifts.

Prices: Gold lapel buttons, $4.00, bronze, $2.25; Tie Clasps, $5.00; China Ash Trays, 75c. Write for other prices.



Order From

Soil Conservation Society of America

1016 Paramount Building, Des Moines, Iowa

(*Continued from page 259*)

tween these sessions a delicious barbecued chicken dinner was served by Chapter members from Bishopville and Darlington. Pete Green, Bishopville, was chairman of the local arrangements committee and W. Lee Colburn, Darlington, cooked the chickens.

Entertainment was presented by Mr. and Mrs. C. S. Moss and their four children of Greenville.

The group petitioned the SCSA to make Joe Douthit, Pendleton, chairman of the South Carolina Soil Conservation Committee, an honorary member of the SCSA.

Suggested Chapter activities agreed to were: (1) Sell SCSA cartoon booklet entitled "Land—Its Use and Misuse" published by the *Society*. (2) Sponsor an annual award for an individual in South Carolina each year who has done an outstanding job in soil conservation. Only SCSA members are eligible. Council members and officers of the Chapter are responsible for the details of handling this award program. (3) The Chapter sponsor, in so far as financial resources permit, a delegate to the annual meeting of the SCSA each year. Chapter Council members and officers will select the delegate. (4) Chapter Council members and officers consider at their next meeting an adoption of a creed for professional conservationists, and (5) Each member explain the *SCSA* to at least one prospective member and invite him to join the *Society*.

Officers elected for the new year were: J. B. Earle. area conservationist, SCS, Chester, South Carolina, chairman; W. A. Mason, Newberry, vice chairman; E. L. Shull, Winnsboro, secretary-treasurer; and Council members as follows: M. Y. Blakely, Laurens; H. P. Fulmer, Lexington; Warren M. Stuck, Waltersboro; and Edwin W. Gresham, Spartanburg.

A motion of appreciation to outgoing officers was unanimously passed.

Manhattan Chapter Has a Barbecue

Fifty-three adults and 14 children attended the summer meeting of the Manhattan Chapter of the *Soil Conservation Society of America* at the T. B. Avery farm pond northeast of Fostoria in Pottawatomie County on the evening of June 17.

Following a chicken barbecue which was served by Professor Avery, accordion music was provided by Shirley and Janet McAdams. Dr. O. W. Tiemeier then spoke to the group on the subject of the stocking of ponds with fish, pointing out the important points to be considered in maintaining the proper ecological environment to provide the maximum yield of desirable fish.

Student Chapter Entered Land Judging Contest

The University of Nebraska Agronomy Club (which includes the Student Chapter of the *Soil Conservation Society of America)* sent a Land Judging Team to Oklahoma City on April 29 to compete in the National Land Judging Contest. Although the team failed to place, they brought back valuable information concerning the contest and the trip.

Keeping the Soil Alive

PRODUCTIVE SOIL teems with a multitude of living things: bacteria, fungi, actinomycetes, algae, protozoa, insects, earthworms, nematodes, spiders, mites, and spring-tails. In one way or another, organic matter keeps all these animals and microscopic plants alive—and, thus, organic matter is the very life, the heart, of the soil.

Small amounts of organic matter exert a profound influence on the soil. Essential factors in crop production, such as water penetration, moisture retention, soil structure, plant nutrient supply, and plant decomposition, are directly affected by organic matter. A soil becomes less productive when its organic matter is reduced.

Along with water, timber, and minerals, organic matter is a natural resource that has been exploited and dissipated by careless farming practices. With each cultivation, the soil "dies" a little, unless the organic matter used is replenished.

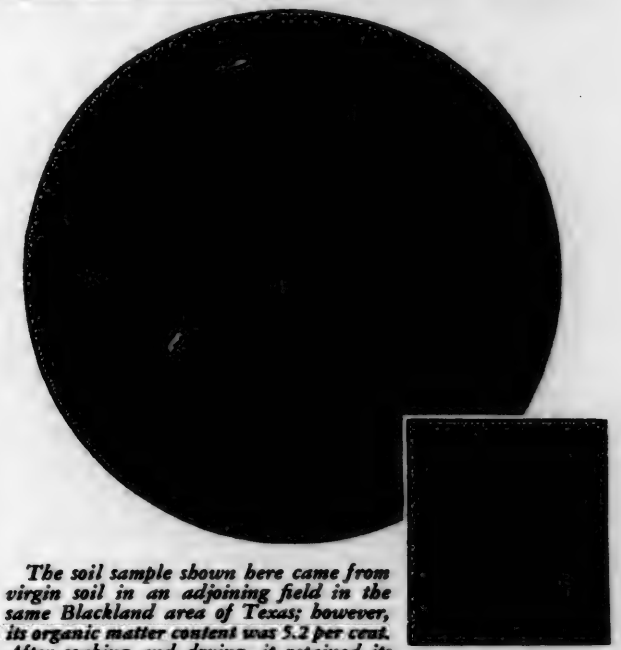
For proof that organic matter makes a big difference in soil structure, compare the two soil samples pictured on the right.

●

Putting organic matter in the soil is like putting money in the bank: Its value builds up with interest and it can be used as needed.

Making a Deposit in the Soil Bank

When this soil sample (square) was taken from the Blackland area of Texas, it was dry and crumbly, appearing to have a good granular structure. After soaking and drying (circle), it became badly caked and cracked—75 years of continuous cropping had lowered its organic matter content to 2.8 per cent.



The soil sample shown here came from virgin soil in an adjoining field in the same Blackland area of Texas; however, its organic matter content was 5.2 per cent. After soaking and drying, it retained its original granular condition, showing that good soil structure results when organic matter is not depleted from the soil.

JOHN DEERE • Moline, Illinois

Reprints of this page available

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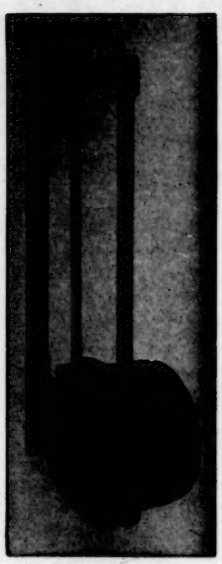

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Members "Lost"— Your Assistance Needed

Each year over 1,500 *Society* members change their address. To maintain an accurate mailing list is a major task in the national office. At the present time, mail has been returned from the following individuals and anyone knowing their present address will assist the individual in securing his publications if you would notify the *Society* at 1016 Paramount Building, Des Moines 9, Iowa.

The individuals and their last known addresses are as follows:

Elmer C. Hansen, Box 1089, Lancaster, Calif.
Mark Wild. R. 1, Colorado Springs, Colo.
Miss Hilda Spink Cunniff, 404 South St., Key West, Fla.
David P. Powell, 2227 N.W. 15th Pl., Gainesville, Fla.
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South Carolina Member Suggests Chapter Program

The following excerpts from a letter by Douglas E. Wade, Education Assistant, South Carolina Wildlife Resources Commission, Columbia, South Carolina, should be of interest to chapter program chairmen.

He writes as follows: "I should like to suggest for one meeting of the chapter that discussion be held of the article, 'Land Classification As a Guide In Production Adjustment Programs,' by Stackhouse, *et al.*, Vol. 10, No. 4, JOURNAL OF SOIL AND WATER CONSERVATION. Without going into too much detail, I feel the land classification system ought to be re-examined. For instance, the Fish & Wildlife Service has made, in the past two years, a notable effort in classification of wetlands. Then, too, there are many other items to be examined in the article mentioned.

"A suggested procedure for getting this article discussed and the results summarized in writing is:

(1) Obtain a supply of reprints for distribution to all members of the chapter.

(2) Select a panel that would represent major interests relative to the subject matter.

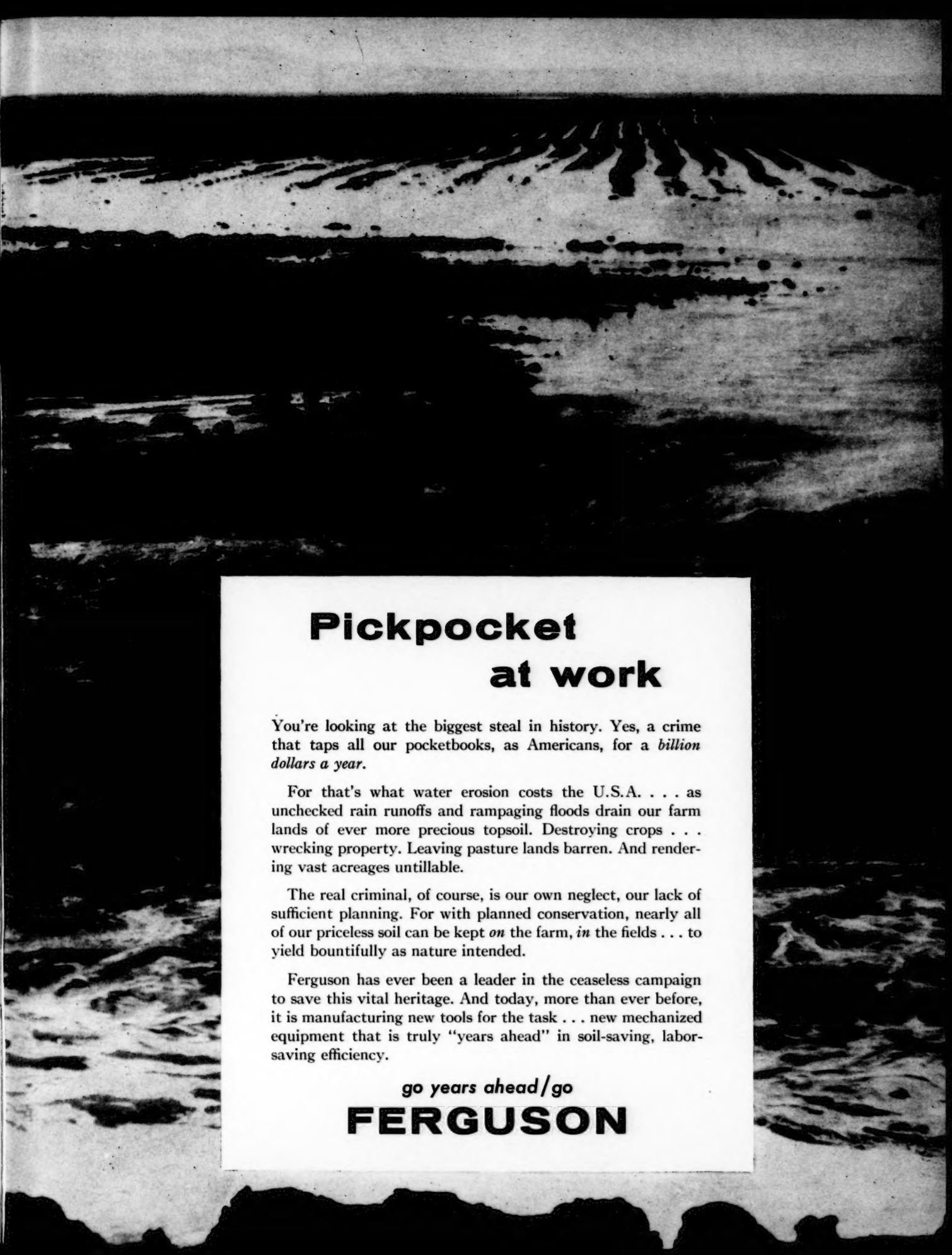
(3) Create in the meeting a flow of discussion between panel members and chapter members.

(4) Record summaries reached as article is discussed; discussion to follow closely the progression of ideas in the article.

"If most of the chapters of the S.C.S.A. would dig into the article in such a way and send summaries to the national office it might be possible to move the thinking about certain problems involved in land classification ahead several years."

(Secretary's comments—The above is a very excellent suggestion, both as to subject matter and method of procedure, to plan a chapter meeting.

If chapters hold such a meeting and send summaries to the national office, they will be reviewed in News Notes and forwarded to the national committee on land classification now in the progress of reorganization under the direction of Wallace Mitchelltree, Rutgers University, and chairman of the Society's technical committees. One of the technical committees which will have a report for the 1956 annual meeting will be a Land Utilization Committee.)



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